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CONTENTS.

Original Communications.

PAGE

New Therapeutic Agencies. By Prof. Dujardin-Beaumetz..... 145
Urinary, Urethral, Catheter, or Urine Fever, with the Report of a Case. By C. G. Buchanan Klophel, M.D.... 152
Dr. Gustaf Zander's Mechanico-Therapeutic Institute in Stockholm. By Kate C. Hurd, M.D..... 161
Strychnine Pills—Alkaloid *vs.* Sulphate. By H. F. Meier..... 167

Leading Articles.

The Report of the Hyderabad Chloroform Commission..... 170
The Action of Cathartics..... 172
The Comparative Activity of the different Digitalin Preparations..... 175

Reports on Therapeutic Progress.

PAGE

Treatment of Acute Pneumonia by Inhalations of Chloroform..... 169
The Second Hyderabad Chloroform Commission..... 175
The Fatal After-Action of Chloroform.. 186
The Relation between Peripheral Irritation and Nervous Phenomena, with Special Reference to Eye-Strain..... 187
Angina Pectoris and Pseudo-Angina..... 191
Treatment of Goitre by Interstitial Injections of Tincture of Iodine..... 194
Aural Complications in Acute Specific Fevers..... 195
The Rational Treatment of Bronchial Asthma..... 197
Surgery of Infancy and Childhood..... 198
Diuretic Properties of Sugars..... 199
The Surgical Treatment of Hepatic Abscess..... 199
Cocaine in Yellow Fever..... 200
The Treatment of Erysipelas by Subcutaneous Injections of Carbolic Acid..... 201
Oxytocic Action of Quinine..... 202
The Symptoms and Conditions which justify Nephro-Lithototomy..... 202
The Treatment of Epilepsy..... 203
The Action of Solanin and Solanidin.. 204

Reviews..... 205

Correspondence.

Paris Letter..... 208
Berlin Letter..... 210
Berlin Letter..... 212
Dose of Fluid Extract of Gelsemium.. 214

Notes and Queries.

A New Constituent of Tea..... 214
A Rare Case of Idiosyncrasy to the External Use of Tannin..... 215
Lactation during Menstruation..... 215
Antipyrin and Chloral Hydrate..... 215
Sulphur Worthless for Fumigation..... 216
Aristol..... 216

Original Communications.

*NEW THERAPEUTIC AGENCIES.**

LECTURE IV.—ON VEGETARIANISM FROM A THERAPEUTIC POINT OF VIEW.†

BY PROFESSOR DUJARDIN-BEAUMETZ,‡ PARIS, FRANCE.

THE subject which I have chosen for this lecture is one of utmost importance in connection with the question of the application of diet to the treatment of disease. I hope to show you that if vegetarianism is not adapted to the well man and to our climate, a vegetable diet may, nevertheless, be most appropriate in a large number of affections of the stomach and kidneys. This subject has, moreover, given rise to numerous disputations, the literature of which would constitute a library by itself; from these writings, in fact, I have derived the principal materials for this lecture.§ I will call your attention

* A second series of "New Medications," published in 1887.

† From advance sheets, revised by the author (translated by E. P. Hurd, M.D.). Lectures delivered in Cochin Hospital, Paris, France.

‡ Member of the Academy of Medicine, Physician to the Cochin Hospital, Paris, France.

§ See and compare: Dock, "Du Végétarisme, ou de la Manière de vivre selon les Lois de la Nature," Saint-Gall; Docteur Théodor Hahn, "Der Vegetarianer" (Recueil Mensuel, Saint-Gall); Meta Welmer, "Les Végétariens," Lausanne; Raoux, "Du vrai Végétarisme et de ses Avantages" ("Manuel d'Hygiène générale et de Vé-

particularly to the interesting thesis defended before our Faculty, in 1880, by Algernon Kingsfordt, and the larger work since published by Edmond Pivion on the same subject.*

To decide this question, we must appeal successively to physiology, anatomy, and anthropology.

By the structure of his digestive tube, by the conformation of his teeth, man naturally finds his place in the group of omnivorous animals, and it is by virtue of this ability to subsist on all kinds of food that human beings can live in all climates. Carnivorous in cold countries, man becomes vegetarian in warm climates; and in this connection I can but allude with reprobation to one of the most specious arguments of the vegetarians, who, basing themselves on the close similarity which exists between the digestive tube of man and that of the primates, have maintained that, like the ape, man should be herbivorous and frugivorous.

This circumstance has not the argumentative value which the vegetarians attribute to it, for monkeys live only in warm countries, where man himself is vegetarian, and if there were species of monkeys living in our climates, they would probably be carnivorous like ourselves; we may, in fact, subject the monkey in our own country to the same mixed diet on which we subsist, and he will thrive on it.

This question of climate does not seem to have had the importance assigned to it which it deserves in the numerous discussions which have arisen in reference to vegetarianism, and I fear that writers have overlooked the wide differences which exist between the conditions of man inhabiting tropical regions and those of man living in the temperate and frigid zones.

We see the Englishman, a meat-eater *par excellence*, who derives from this regimen great advantages when he lives in his own country, become sick under the influence of this same alimentary regimen when he inhabits the torrid zone, as India, where he is forced to become vegetarian if he would keep in health.

I believe, then, that from an anatomical point of view, man and a certain number of animals, as the hog, should be ranked among the omnivora, and to this classification, save with respect to the monkey, no serious objection has been raised.

Let us see now what data are furnished by physiology and anthropology.

It is certain that, according to the climates in which he lives, man may find in a purely vegetable diet all the elements necessary to engender force and substance, and it is a mistake to affirm that an animal diet is absolutely indispensable for the production of force. Is it not from animals strictly herbivorous—the horse and the ox—that we obtain the greatest sum of muscular work? And the Hindoo, the Chinese, the Tonquinese, who live exclusively on rice, are able to do an amount of labor equal and even superior to that performed by the workingmen of the countries of the north who live on meat.

Moreover, we may affirm that the greater number of the inhabitants of the globe, whether by necessity or in consequence of their religion, subsist on a vegetable diet; but when we come to the countries in the frigid and temperate zones, we easily find proof that the introduction of meat into the diet of the laboring man augments the production of his work.

In a work devoted to the subject, Dr. Kingsfordt enumerates at some length the different regions of the habitable globe where the people live exclusively on vegetable food, and remarks that in the northern countries the lower classes are mostly vegetarian. The fact is too true, and we see still, in France, multitudes of our day laborers in the country living on a daily fare in which meat constitutes hardly any constituent. But such writers as Kingsfordt forget that this kind of diet is imposed on the laboring classes by the poverty and misery of their situation, and, certainly, the Irishman, who lives mainly on potatoes, would be very glad to eat meat if he could get it. What it is necessary to show is not the possibility of living on a vegetable diet in our climate, which is not under dispute, but that a vegetable diet from the point of view of the production of work is superior to a diet containing, in addition, a certain quantity of meat. Here statistics are in blank contradiction to the contention of the vegetarian, and in proportion as in our country-places the alimentary ration is improved by the addition of animal food in larger quantity, the health of the people is made

gétarisme," Lausanne); Bonnejoy, "Principes d'Alimentation rationnelle;" Cocchi, "Le Régime de Pythagore;" Algernon Kingsfordt, "Alimentation végétale chez l'Homme" (Végétarisme, *Thèse de Paris*, 1880); *La Réforme Alimentaire*, January, 1887.

* Edmond Pivion, "A Study on the Regimen of Pythagoras: Vegetarianism and its Advantages." Paris, 1885.

better, and the production of work is augmented, and this is especially perceptible in our great industrial establishments, mines, and ship-yards.

Moreover, the history of mankind goes to show that, from the very origin of the human race, man has been able to adapt himself to the climates in which he has lived by reason of this very fact that he is an omnivorous animal. The primitive man, before he had come into possession of the weapons of offence, which enabled him to subjugate and kill the animals around him, must have been strictly a vegetarian, but when once he learned to use arms and weapons of destruction, he became carnivorous, and the troglodyte of the Vézère cooked over the fire, which he kept ever burning before the door of his cave, the morsels of the reindeer which he had killed in the chase. The necessity of using a flesh diet was imposed upon him by the rigorous climate in which he lived. Our country was then undergoing the rigor of the glacial period, and the reindeer and the bear lived here in abundance.

On the other hand, in warm countries man could fare very well without meat. In India, that cradle of the civilization of Indo-European races, we see the vegetarian regimen prescribed by the prevailing religion, and you will find in the books of the law of Manou sentences like the following :

" He who, in conformity to the law, refuses to eat meat vampire-like is beloved in this world and is not afflicted by diseases."

One of the reformers of the religion of Brahma, who died B C. 600, Buddha-Gautama or Sakya-muni, condemns absolutely the usage as food of everything that has had life. It is the same in China, where Buddhism, which was introduced about A.D. 64, proscribes animal food.

We see this proscription repeated by the great philosophers and reformers, who all appear to be struck by the evils resulting from excesses in eating, and especially from excesses in animal food, and this is noticeable even in the fabulous periods of our history. Homer extols the lotophagi who lived on milk and fruits. He opposes the ferocity of the Cyclops—eaters of flesh—to the mildness of manners of these eaters of the lotus.* The history of Prometheus gives also the same idea. Prometheus steals fire from heaven in order to make unwholesome viands palatable, and everybody knows what was the penalty of the theft.

But it is to Pythagoras, of Samos, who lived B.C. 608, that the honor belongs of having established the vegetarian regimen, which has since been also called the regimen of Pythagoras. Nevertheless, Pythagoras' dietary was far from presenting the severity which has since been attributed to it, for, according to Cocchi, Pythagoras did not absolutely prohibit meat, but allowed his followers "to eat the flesh of young and tender animals."

Socrates and Plato held and taught the same notions, and in Plato's "Republic" Socrates makes the inhabitants of this island vegetarians; hence his interlocutor Glaucon, who seems to believe in more substantial fare, makes this reply, after hearing of the frugal vegetarian meal enjoyed by the inhabitants of this republic: "If you were organizing a state of swine, would you feed them a whit differently?"

You will continually find these same vegetarian doctrines in almost all the ancient philosophers,—Seneca, Plutarch, etc. It is the same with the fathers of the Church, in whose writings one might point to scores of passages which show that the ascetic regimen was followed by a great number of these fathers; passages which Balzer, a clergyman, has collected into a volume, which bears the somewhat strange title of "Vegetarianism in the Bible." Thus it is that St. Chrysostom, St. Jerome, St. Basel the Great, St. Clement of Alexandria, St. Gregory of Naziance, St. Augustine, etc., extol temperance, and, in particular, vegetarianism, and we have still further a proof of the favor extended by the Church to vegetarianism, in the almost absolute vegetable diet to which certain religious orders—as the Chartreux and the Trappists—are subjected.

In times much nearer our day, we see also the same views carried out, and I will cite, in instance, a dean of our Faculty in 1709,—Hecquet. Hecquet, who was one of the most vehement advocates of blood-letting, and served as a type to Lesage for his Doctor Sangrado, was also an earnest advocate of vegetarianism.

* "Not prone to ill, nor strange to foreign guest,
They eat, they drink, and nature gives the feast;
The trees around them all their food produce;
Lotos the name, divine, nectareous juice."
POPE'S *Odyssey*, Book IX.

Fénelon, in his "Télémaque," conveys the same notion of primitive simplicity in his description of the inhabitants of Crete, who, abstaining mostly from wine and animal food, were a "meek, sober, and amiable race."—TR.

About the same epoch—1760—there was a noted English physician who was a convert to vegetarianism,—Cheyne. Cheyne, who, like Hecquet, condemned, as contrary to the normal state, the eating of flesh, wrote as follows:

"I take for my food milk, tea, coffee, bread and butter, salads, cheese, fruits and cereals of all kinds, potatoes, turnips, carrots. In a word, I eat everything which has not had animal life; these foods afford me a greater variety than a flesh diet. I drink no wine or other liquids, but I rarely am thirsty, for my food is for the most part liquid or succulent. I am always gay and in good trim, and my sleep is sweeter and more sound than when I used to eat meat; for with my present diet I am more active. I rise at six o'clock in the morning and go to bed at 10 P.M."

I should make this lecture far too long if I were to mention all the noted men who have followed the vegetarian doctrine. Thus I need hardly remind you that Voltaire praised vegetarianism, and in his writings points out all the advantages which may be derived from a vegetable diet.

Rousseau descants at length on this subject, and in the annotation which he has made to the article of Plutarch on "Kreophagy," he describes the first meal in which barbarian man partook of animal flesh, and indulges in the following emphatic, if not very poetic, lines:

"Les peaux rampaient sur la terre écorchées!
Les chairs en feu mugissaient embrochées!
L'homme ne put les manger sans frémir
Et dans son sein les entendit gémir."

Cuvier, Buffon, Monthyon, Menard, and others of the same epoch were vegetarians.

But these are, I repeat, exceptional instances, at least in our climate, and no large body of people has ever been persuaded to adopt these views, notwithstanding all the efforts of the various vegetarian societies.

These societies had for their founder Gleizes, who published in 1840 a work entitled "Thalysie, or the New Existence."* This was the starting-point of all the associations called vegetarian, many of which now exist in America and in England. In the latter country the most important of these societies is the "National Food Reform Society." At Hamburg there are also similar societies. In France, Dr. Gayard is the president of the Vegetarian Society. This society had for its organ a journal, which was published in 1881 and 1882, called *La Réforme Alimentaire.* I must also mention the very active part taken recently in the vegetarian campaign by a vehement partisan of this dietary system,—Dr. Bonnejoy, of Vexin.†

All these societies have placed themselves for the most part on a sentimental basis laid down by Gleizes himself, who writes in this manner: "The murderous slaughter of animals is the principal source of the cruelty of man and of his crimes, as the habit of feeding on their flesh is the primary cause of his ugliness, of his diseases, and of the short duration of his existence." And in a letter which Dr. Gayard wrote me on this subject, I find the following passage: "Vegetarianism is less a scientific question, in the strict sense of the word, than a social, and especially a moral, question. The true domain of the question is that of conscience,—*i.e.*, of the moral umpire within us. The supremacy of this inward monitor—the true *ego*—is not acknowledged by all; in gross or depraved natures it is kept out of sight and in abeyance. The practice of vegetarianism is one of the best methods for restoring that supremacy; in other words, for rendering more sensitive the moral sense."

The same idea is advocated by one of the most fanatical partisans of vegetarianism,—Dock, of St. Gall,—who regards vegetarianism "as a regimen at once the most natural, the most human, the most moral, the most æsthetic, the most wholesome for the body and for the soul, and the most economical."‡

But we are not called upon here to concern ourselves with vegetarianism from a social and religious point of view, and we will now take up the pathological and therapeutic aspect of the question.

What impressed all the physicians of antiquity was the evils attending the excessive ingestion of food, and all who have since then practised medicine have remarked these evils. As a general thing, the rich and the idle eat too much, and the daily ration much exceeds the standard amount fixed by physiology to repair the wastes of the organism, a waste estimated, as you know, at twenty grammes of nitrogen and three hundred and ten grammes of carbon for the twenty-four

* Gleizes, "La Thalysie, ou nouvelle Existence," in three volumes, 1840–42.

† Bonnejoy, of Vexin, "The Rational, Scientific Vegetarianism." Bordeaux, 1889.

‡ Dock, "On Vegetarianism, or the Manner of living according to the Laws of Nature." St. Gall, 1878.

hours. Already, in my "Alimentary Hygiene," I have insisted on this point, and would refer you to the three lectures there published on "Alimentary Rations," on "Insufficient Diet," and on "Superabundant Alimentation."*

But the recent labors of Gautier and Bouchard enable us to study this question of vegetable diet from quite another point of view. We know the considerable part which is played by the ptomaïnes and the leucomaïnes in the phenomena of self-poisoning so frequently attending a great number of patients. Everybody seems agreed in attributing to this auto-intoxication the *embarras gastrique*, the congestions of the liver, of which we hear so much, and especially, as I showed you in the last lecture, the most of the symptoms which accompany gastric neurasthenia.

Lastly, in that complex pathological aggregate which has renal insufficiency for its origin, these phenomena of poisoning occupy a preponderant place, and we ought to ask ourselves to-day if, from this special point of view, the vegetarian regimen is not much superior to a meat regimen.

It would appear that in all those pathological states where we need to reduce to the minimum the figure of toxines introduced in the food, a vegetable diet is indicated. But it now remains to determine how we should regulate and prescribe this vegetarian regimen.

First, we must settle upon this important point,—that a vegetal diet may suffice for alimentation. This fact is incontestable, since, even in our own climate, we see the poor inhabitants of entire country districts maintain their health and strength on this exclusive regimen. Moreover, we have analyses to show that man may find in vegetables alone the quantity of nitrogen necessary for his support.

In fact, most starchy and leguminous vegetables contain a certain quantity of nitrogen. Glance over the following table by Payen, and compare the proportion of nitrogen, fatty matters, and carbon, in the different aliments which make part of the vegetarian regimen, and you will see that you have in all of them nitrogen in greater or less quantity. It is easy to understand that you may associate these different foods in such a manner as to constitute an alimentary ration comparable to the regimen of meat-eaters.

	Nitrogen.	Carbon.	Fats.	Water.
Butcher's meat	3.00	11.00	2.00	78.00
Egg's (white and yelk)	1.90	12.50	7.00	80.00
Cow's milk	0.66	7.00	3.70	86.50
Goat's milk	0 69	7.60	4.10	83.60
Brie cheese	2.25	24.60	5.56	58.00
Gruyère cheese	5.00	36.00	24.00	40.00
Chocolate	1.52	48.00	26.00	8.00
Beans	4.50	40.00	2.10	15.00
Haricot (kidney) beans	3.88	41.00	2.80	12.00
Lentils	3 75	40.00	2.65	12.00
Peas	3.50	41.00	2.10	10.00
Hard southern wheat	3.00	40.00	2.10	12.00
Tender wheat	1.81	39.00	1.75	14.00
Indian corn	1.70	44.00	8.80	12.00
Rice	1.08	43.00	0.80	13.00
Potatoes	0.24	10.00	0.10	74.00

Moreover, you have only to refer to the tables which I have published in my "Hygiène Alimentaire" to see how easy it is for a man to find in the so-called vegetarian regimen the quantities of nitrogen and carbon which are necessary and sufficient for him, and which are fixed, you know, according to the figures of Hervé-Mangon, at from 6 to 9 grammes of carbon and from .250 to .360 of nitrogen per kilogramme of the weight of the body.† I say in the vegetarian regimen, for the most fanatical partisans of this regimen allow milk, eggs, and cheese. Here you have, then, according to Pivion, an alimentary ration as simple as possible, in which you will find the 20 grammes of nitrogen and the 310 grammes of carbon necessary to maintain life.

* See these lectures reproduced in *Medical News*, vol. xlix. 505 and 561, and in the THERAPEUTIC GAZETTE, December 15, 1886, p. 793.

† Dujardin-Beaumetz, "Hygiène Alimentaire," 2d ed., p. 115; also *Medical News*, vol. xlix. p. 505.

	Nitrogen.	Carbon.
500 grammes (1 lb.) of baker's bread containing	6.00	150
500 grammes of lentils (peas or beans)	14.74	214
500 grammes (1 pint) of milk	3.30	40
30 grammes of Gruyère cheese	1.65	13
1530 grammes.	25.69	417

Among the foods utilized by the vegetarian regimen, there are some that are highly azotized, and, without speaking of eggs and cheese, I might insist particularly on certain amylaceous products, as lentils, peas, and beans. In my "Alimentary Hygiene" I have shown that the lentil contains a large quantity of azotized products, and, moreover, a notable quantity of iron, more even than is contained in meat. Moreover, none of the starchy foods is deprived of nitrogen. It has, indeed, been maintained that the manioc, on which the Indians subsist who inhabit the banks of the Orinoco, does not contain nitrogen. This is an evident mistake. In an analysis which has been furnished me by Dr. Morel, assistant professor at the School of Toulouse, it is shown that 100 grammes of manioc flour give 22.40 grammes of starchy matters and 9.65 grammes of azotized matters.

But I must speak here more especially of the new amylaceous products,—soja, fromentine, and legumine,—which are proved to be superior, as you will see, to meat itself in the proportion of nitrogen which they contain.

The soja is the Japanese bean (*Glycine hispida*), to-day much cultivated in certain counties of Europe, and, in particular, in Hungary, since 1875. This bean, which contains extremely little starch, and has been employed in the dietetic treatment of diabetes by Lecerf, contains a very large amount of azotized matters; and, on referring to the different analyses published by Steuff, Capan, Pellet, and Muntz, we find the following percentage of the alimentary principles contained in this bean:

	Per cent.
Protein matters	36.67
Fatty matters	17.60
Starchy matters	6.40

If now you compare this analysis with that of meat, you obtain the following result:

	Beef.	Soja.
Water	74.00	9.37
Proteinaceous matters	22.74	36.67
Fatty matters	2.30	17.60
Potassium	0.54	3.10
Phosphoric acid	0.66	1.47

As you see by these figures, the Japanese bean has the decided advantage over beef.

From an alimentary point of view, soja serves several uses. A sauce is made from it which bears the name of *stiso* and *soju;* but the most curious and interesting point in the application of soja to dietetics is that a kind of cheese can be made from it—it is the *pea* or *bean cheese*, very much prized in Japan; and those who would like to know more about the fabrication of this cheese will find all the information they desire in the article of Egasse, "On the Economic and Therapeutic Applications of Soja," in the *Bulletin de Thérapeutique*, vol. cxv. p. 133.

In Europe the soja has been utilized for the food of men and animals, and in the last few years the attempt has been made to make bread of it, which is a matter of considerable difficulty by reason of the large proportion of oil which this bean contains. This oil, as Leon Petit has shown, is very purgative, and might replace castor oil in medical practice. Hence it becomes necessary to rid the meal of this oil in order to render it fit for our domestic usages. Lecerf, in Paris, and Bourdin, in Rheims, have succeeded in rendering the bread fabricated from this meal very well supported by the stomach.

Here, then, we have a bean which is more nutritive than meat, and which serves for nourishment to a great country like Japan under the different forms of sauce, of cheese, of farina, and even of a real artificial milk. You will see all the advantage which the vegetarian regimen may derive from such a food.

Fromentine is also a highly azotized product; it is obtained from the embryos of wheat by certain new processes of grinding and bolting. These embryos contain, like the soja bean, a certain quantity of oil, which is purgative, like soja oil, and may take the place of castor oil. The analysis of these dried and pulverized embryos have given Douliot the following figures:

Albuminoids	51.31
Ternary substances	29.08
Cellulose	12.63
Mineral substances	6.98

It is, as you see, a true vegetable meat; but here, as in the case of soja, it is the presence of the oil which hinders the making of bread of this flour, and this oil must be got rid of if the fromentine is to be used either for bread or gruel. Of this farina different culinary products are made, which are now much in use; there are biscuits and cakes of fromentine, and it is much utilized in the form of gruel or porridge. When you order fromentine meal, you must take care first to incorporate this meal in a certain quantity of water before adding it to the milk or *bouillon* which is to serve for the vehicle. Without this precaution, you would obtain clots, or lumpy concretions, which spoil the appearance of the porridge.

Bovet has prepared, under the name of legumine, a substance similar to fromentine, and having for its basis not only the embryos of wheat but also those of the papillonaceæ.

It is necessary to avoid, in the vegetarian regimen, giving the starchy grains enveloped with their hulls. Hence I always take care to order amylaceous substances in the state of *purée* or stew, to which you may add green vegetables, such as carrots, turnips, potatoes, etc.

One may also give a certain variety to the vegetarian regimen, and I know of no better examples in this regard than the bills of fare of vegetarian banquets, such as you will find in the *Réforme Alimentaire*, the organ of the vegetarians in France.*

Under the name of *quaternaires* are comprised the quaternary aliments. As for the Graham bread, it contains all the elements of the wheat,—that is to say, the flour and the bran. The vegetarians consider the presence of this bran as increasing the nutritive properties of the bread; this is a statement which cannot be admitted, for, relying on very exact analyses, I have shown in my "Alimentary Hygiene" that white bread of the first quality contains more nitrogen than bread of an inferior quality, and particularly bran bread.

You will also find in the same journal some very curious receipts; for example, turbots and frogs *à la végétarienne* (mock-turbot and mock-frog), which show well that, in spite of their pretension, man is more omnivorous than the vegetarians would fain admit. You will also find, in the "Principles of Rational Alimentation," by Bonnejoy, of Vexin, some culinary receipts applicable to the vegetarian regimen.

Now that it is demonstrated that by a regimen of eggs, milk, vegetables, and fruits one may find not only a sufficient dietary, but even a variety, which might satisfy the most delicate palate, it remains to consider in what circumstances we may for therapeutic ends apply this vegetarian regimen. But, first, we must discuss still another point,—namely, what are the beverages which should be taken with the vegetarian diet.

From a physiological point of view, the wines augment the acidity of the gastric juice, and we know that eaters of meat are also drinkers of wine and alcohol, while, on the contrary, vegetarians ought to be water-drinkers or beer-drinkers; the latter, by the malt and diastase which it contains, favors the digestion of starches.

Hence, in England and the United States, we see the temperance societies and the vegetarian societies working hand-in-hand. I believe that, with the vegetarian regimen, one should be very moderate in the use of wine, and never take any intoxicant stronger than diluted wine, beer, or cider.

The affections of the digestive tube or of the stomach to which the vegetarian regimen is applicable are numerous. This regimen,

* Here is one of these *menus*, which the translator feels obliged to give with scarcely any attempt at rendering into English:

Potages.—Purée of lentilles, soupe printanière.

Hors-d'œuvre.—Beurre, radis, olives (butter, radishes, olives).

Entrées.—Œufs à la coque (eggs in the shell), asperges en branches (asparagus).

Quaternaires.—Macaroni au blanc de poule (with white of egg), petits pois (green peas).

Saccharins.—Crème à la vanille (vanilla cream), ruches d'amygdaline savarin.

Dessert.—Fromage suisse (Swiss cheese), compote de pommes, confiture de fraises, dattes, oranges, gaufrettes (waffles).

Vins.—Mâcon vieux, Saint-Émilion.

Pain de Graham (Graham bread).

Here is another *menu*:

Potages.—Crécy, gruau d'avoine (oatmeal gruel).

Entrées.—Timbale végétarienne, pommes nouvelles au beurre.

Quaternaires.—Œufs brouillés aux pointes d'asperges (scrambled eggs with asparagus tops), fèves de marais à la sariette.

Salades.—Laitue (lettuce) et romaine au jus de citron.

Saccharins.—Riz, baba, crème à la fleur d'orange, gâteau génois à l'abricot.

Dessert.—Fromages, compote d'ananas, confiture de groseilles, fraises, oranges, biscuits à la framboise.

Vins.—Mâcon, Saint-Émilion.

Pain de Graham (Graham bread).

in fact, reduces to a minimum the toxines which enter the economy by the food.

Remember, in fact, what I told you last year *à propos* of the ptomaïnes and leucomaïnes.* As soon as death smites the living being, and at the very instant when death appears, the ptomaïnes manifest their presence. At first non-toxic, they become toxic from the fourth or fifth day which follows death, and these substances are sufficiently deleterious to promptly cause the death of animals to which they are administered. Among these toxic alkaloids I will mention, particularly, neurine, mydaléine, putrefactive muscarine, methylganine, etc. Moreover, according to the animal species, these ptomaïnes are more or less active; thus, putrefied fish furnish a great number, such as ganidine, parvoline, and especially ethylenediamine. Mussels give mylotoxine, which is the cause of poisoning by these mollusks. We find also certain of these ptomaïnes in ripe cheeses. As man consumes a great quantity of animal substances whose time of killing often goes back to eight or ten days, it is easy to understand what a fruitful source of poisoning may be there found; this danger is avoided by those who adopt the vegetarian regimen.

If vegetable substances may undergo putrescent alterations, these are much less likely to take place with respect to vegetable than to animal food. Hence this diet system becomes obligatory whenever, by the bad functioning of the kidneys or digestive tube, the toxines may accumulate in the economy.

In the first rank we will place all those cases where there exists renal insufficiency. Whether this insufficiency results from interstitial nephritis, from catarrhal nephritis, from fatty degeneration of the kidneys, we should enjoin a vegetable diet. I shall return to this subject when I come to speak of the treatment of renal insufficiency. In the dilatation of the stomach of gastric neurasthenics, this same regimen also gives good results. Lastly, in the putrid diarrhœas, the vegetarian regimen is also indicated.

But there is another point of view in connection with which this regimen gives good results. I refer to the irritations of the gastric mucous membrane,—acute or chronic gastritis. In fact, this regimen demands little of the stomach; the labor of digestion is imposed principally on the intestines, and the stomach is thereby given an opportunity to rest. Lastly, in the dyspeptic troubles, properly so called, which result mostly from modifications in the gastric juice, whether this be an exaggeration or a decrease in the acidity of this fluid (*hyperchlorhydria*, or *hypochlorhydria*, as Germain Sée calls it), this dietetic system enables us to cure these affections without imposing any work on the pepsin glands. Lastly, in the general diseases characterized by hyperacidity, such as the uric diathesis, we can still derive benefit from the vegetarian regimen.

To sum up, then, and as the conclusion of this lecture, I would say, if from an anthropological and physiological point of view, man is omnivorous, and may, according to climates and according to his necessities, live on a flesh diet, or on a mixed diet, or on a vegetable diet, from a therapeutic point of view, the latter regimen as applied to our climates constitutes a very important method of treatment, which is demanded in a great many gastric and renal, as well as general, affections.

In the next lecture I shall take up the study of the treatment of diarrhœa and constipation.

* THERAPEUTIC GAZETTE, November, 1888, "On Ptomaïnes and Leucomaïnes."

URINARY, URETHRAL, CATHETER, OR URINE FEVER, WITH THE REPORT OF A CASE.†

BY C. G. BUCHANAN KLOPHEL, M.D.,
ROCHESTER, N. Y.,
Member of the New Sydenham Society, London, etc.

ALL shades of authoritative statements have been advanced as the true solution of the perplexing problem,—the pathogenesis of this disease,—and as the question is still a moot one, the terms urinary, urethral, catheter, or urine fever have been applied to the various morbid phenomena associated with certain operations upon the urethra and bladder. They express the general understanding of probably the majority of operators with regard to it. The disease has been recognized for more than three-quarters of a century. Stating briefly some of the various opinions regarding its etiology, it is regarded by some as arising from the decomposition of unhealthy urine, under certain conditions within the urethra, and we have those who regard it as a reflex nervous

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phenomena; some who consider it the product of nervous disturbance of already diseased urinary organs; some who consider it the general effect of a ptomaïne; many who believe several of these forces to be at work in its causation; doubtless many who regard all the reasons valid, taken as a whole, and applied individually and collectively to suitable cases. Likewise as regards its treatment the same confusion exists.

It was known in 1800, but not clearly defined, that surgical interference with the urethra and bladder was sometimes and under certain circumstances followed by an irritative fever. However, it was not until 1810 that Moffatt, as quoted by Velpeau, described a case of chronic stricture of the urethra, in which simple catheterism was followed by rigors, irregular fever, purulent arthritis, and death.

In 1832 ideas concerning the casual relationship of catheterism to consecutive fever first found form and expression in the writings and teachings of Brodie and Velpeau, and, perhaps, in the teachings of Civiale. Brodie distinctly and even emphatically mentions the danger of catheterism, and describes as occasionally occurring, in consequence of it, paroxysms of irregular fever, like ague, and leading sometimes to prolonged debility; sometimes to continued fever, with rheumatic pains; and sometimes even to mania. He further stated that in such cases death may follow, but he cites no case of its actual occurrence.

The fact that the disease may follow, with more or less gravity, the skilful and unopposed introduction of an aseptic catheter, even though there be "apparently" absence of any mechanical injury to mucous membrane, has given rise to the hypothesis that the urethra is endowed with some peculiar sensibility not possessed by other mucous membranes, which may be called into action by the simple contact of a smooth and soft catheter, and which, thus aroused, exerts an influence not only upon the organs in its immediate vicinity, but also upon the circulation through the kidneys, and even upon the heart itself.

Nearly all writers on this subject attach the greatest importance to an extreme sensibility of the urethra, in consequence of which, simple contact, which, in the case of other mucous membranes might be harmless, here arouses the gravest disturbance.

Belfield says, "So far as I am aware, there is no proof, either physiological or clinical, that a chronic and continuous reflex action, purely nervous, is ever manifested as the result of a solitary local irritation such as the introduction of the catheter. It may be asserted, without fear of contradiction, that any chronic and continuous disorder of the urinary organs, traceable to the introduction of a catheter, or sound, or other operation in the urinary channel, is based upon morbid anatomical changes, and is not of merely reflex, nervous origin. The introduction of the instrument may be, it is true, the initial step in the pathological process; the catheter may empty an habitually distended bladder; the sound may accomplish the same result by dilating a tight stricture; but the disastrous consequences which follow in either case are due, not to the contact of the instrument with the susceptible mucous membrane, but to the mechanical congestion in the urinary organs caused by the removal of a chronic impediment, and the relief of a chronic distention of the bladder, ureters, and kidneys. The morbid anatomical features of the case may be overlooked or unappreciated, but they are, nevertheless, present."

He further states: "Yet there are, doubtless, cases in which reflex action, purely nervous,—that is, without perceptible foundation in morbid anatomical conditions,—can be properly assumed as the cause of urethral fever." These, he says, are acute cases,—those in which the initial symptoms are manifested immediately, or, at least, within twenty-four hours after the introduction of the instrument, which attain their acme in a few days at most, and terminate either in death (rarely) or recovery within three days. In all these there are symptoms of heart failure. In the most pronounced this failure may attain such a degree as to occasion faintness, syncope, and even death may be indeed termed "shock." In less severe and usual cases this failure of the circulation is indicated by coldness of the extremities and chill.

For these phenomena there is a physiological basis. That certain of the pelvic mucous membranes are intimately associated with important nerve-centres is demonstrated by both clinical and experimental observations. During the discussion of a paper on "Catheter Fever," by Sir A. Clark, at a meeting of the Medical Society of London (*Lancet*, December 22, 1883), Mr. Savory emphasized the above clinical fact in the following words: "Every surgeon must be familiar with the

fact—which is confirmed by physiology—that, during the administration of anæsthetics, after the power of reflex action has ceased in all other parts of the body, it can still be provoked by irritation about the urinary organs. If you decapitate a turtle, and wait for some hours, the power of evoking reflex action dies out part by part, but the last part in which you can evoke it is in the region of the cloaca." I suppose it must be in the experience of every surgeon that occasionally, even in the very young and healthy, a considerable amount of shock is caused by the introduction of the instrument. I suppose it must have occurred to all to see in some cases, even after sounding children for stone, that a decided shock is produced by the operation. It is also in the experience of many surgeons that the introduction of an ordinary catheter or sound, even as far as the fossa navicularis, has been followed by chill and decided prostration of the patient; and it is comparatively seldom that a sound or catheter can be passed for the first time through the prostatic urethra, even of a perfectly healthy man, without causing some slight indication of nervous depression.

The urethra is not the only mucous membrane whose irritation may have a depressing effect upon the circulation, for it is a fact well known by surgeons that during operations involving the anus and rectal sphincters, a patient, under the influence of an anæsthetic, is peculiarly prone to exhibit failure of the heart or respiration.

As I previously remarked, most surgeons connect the phenomena with local nerve injury. Confirmations of this opinion and observations are recorded by Gross, Otis, Coulson, Sir H. Thompson, Professor E. Dittel, and others.

Belfield has directed attention to the fall of blood-pressure, associated with mechanical irritation of the mucous membrane of the vagina or rectum. While making some experimental researches in the laboratory of Professor von Basch, in Vienna, he accidentally discovered and was enabled to demonstrate that mechanical irritation of the mucous membrane of the vagina or rectum, near their respective orifices, caused in curarized dogs an immediate and pronounced depression of the blood column and of the heart's action. This depression amounted in some instances to more than fifty per cent. of the entire blood column, an amount certainly ample to cause decided symptoms of nervous and circulatory depression, if induced in the human animal. He was further enabled to ascertain that this effect was produced by a true reflex action, involving certain branches of the sacral nerves, the spinal cord, and the splanchnic nerves, for the circulatory depression failed to appear after mechanical irritation, if the sacral nerves, on the one hand, or the splanchnic nerves, on the other, were divided.* That the same power is possessed by the urethral mucous membrane he was enabled to satisfy himself by a simple though effective experiment.

Belfield's conclusions are as follows: "A general survey of the subject suggests that the various morbid conditions which may be excited by the passage of sounds and catheters into the urethra and bladder, comprising, among others, the somewhat ill-defined groups of symptoms known as urethral fever, are due to various causes, chief among which may be named the following:

"1. Reflex action, a purely nervous phenomenon without appreciable anatomical lesion.

"2. Laceration of the mucous membrane of the bladder or urethra.

"3. Congestion of urinary tract, caused by the sudden evacuation of an habitually distended (and usually hypertrophied) bladder.

"4. An aggravation of pre-existing renal disease by the sudden removal of an habitual impediment to the evacuation of the urine.

"5. The introduction of septic matter into the bladder by the use of unclean instruments.

"Clinically, it will be observed that the chill, fever, and other constitutional disturbance, devoid of anatomical explanation, and therefore explained by reflex nervous influence, are exhibited within a very few hours after the passage of the instrument, perhaps even beginning during its introduction; while those conditions which are caused by circulatory disturbance, often culminating in inflammation, manifest the first symptoms rarely in less than twenty-four hours, and often after the lapse of several days, subsequent to passage of the instrument."

Sir Henry Thompson has described three forms of this disease. The first a simple febrile attack, or, in other words, an acute transient attack, manifested by a rigor and some fever, occurring several hours after the passage of an instrument, commonly after the first passage of urine. The second

* These observations of Belfield were first published in Du Bois Reymond's *Archiv für Physiologie*, 1882, page 298, entitled "On Depressory Reflexes generated by Irritation of Mucous Membranes."

he terms the acute recurring form. In this the rigors occur every few days, with no regular interval. After four or five attacks of rigors and fever, it disappears, leaving the patient much lowered in health. The third form he considers distinct from the two former, and which he thought might be very properly termed chronic or continuous urinary fever. This form, he says, "Comes on very insidiously, not necessarily by any smart rigor, but with, perhaps, a little chilliness in an old man who has had defective power of passing urine for a very long time." At the end of one of his lectures he says, "I have never seen this continuous chronic form appearing in elderly men after long-standing obstruction of the urethra without advanced renal and uræmic disease."

Some writers emphasize the necessity for an examination into the condition of the kidneys before undertaking any operation upon the urethra or bladder as a precaution against serious urethral fever.

Belfield, in writing of the precautions to be observed before catheterism, says, "More frequent and more susceptible of injury are the cases in which there exists not an acute, but a chronic retention of urine in consequence of prostatic hypertrophy or stricture of small calibre."

He emphasizes the danger of complete evacuation of the bladder in cases of chronic retention; those who have had any experience in that line will doubtless appreciate the vast importance of the subject and the correctness of Belfield's premises. In another place he remarks as follows: "Before introducing a catheter it is important to ascertain as definitely as possible the condition of the urethra, the prostate, and the bladder. The possible existence of a stricture, or of a false passage from previous instrumental examinations; hypertrophy of the prostate, paresis, atony, or hypertrophy of the bladder; contraction of the meatus, and phimosis should all be the subject of inquiry, for if none of these exist, the dexterous introduction of the catheter can scarcely occasion any evil; while, in the presence of one or more of these conditions, even skilful catheterism may occasion serious results. The experience of every surgeon furnishes instances in which the simple skilful introduction of a catheter has been followed by more or less unpleasant results, ranging in severity from slight chill and fever to a general inflammation of the urinary tract,—cystitis, pyelitis, nephritis,—or to fatal anuria."

The literature of this class of diseases abounds in similar instances, which have happened even to the most distinguished and skilful of modern surgeons; and in warnings as to the possible disasters consequent upon the introduction of an instrument into the bladder. Yet but few, if any, of our standard text-books upon the subject make a very clear and decisive distinction between those cases which may be catheterized without danger and those in which disaster may be apprehended. In nearly all cases the danger is ascribed to the introduction of the instrument *rather than to the evacuation of the residual urine*,—the real element of peril. Whenever the catheter is to be introduced, in cases of retention of urine, in individuals who have stricture, enlarged prostate, or other impediment, which we may reasonably assume has caused dilatation of the bladder, care should be taken to evacuate not more than half of the urine, whose quantity can be estimated by palpation over the pubes; and through the rectum, by percussion of the abdomen, etc. If this rule were generally observed, the introduction of the catheter would not be held responsible for nearly so many inexplicable and unforeseen disasters as is now the case, and instances of urethral fever would be less numerous. As a solution of this perplexing problem, Belfield suggests that not more than two ounces of the residual urine be removed on the first use of the instrument; and that a saturated solution of boracic acid, equal in volume to one-half of the residual urine removed, be injected and allowed to remain, and that similar precautions be observed in introducing the catheter in cases of long-standing, contracted stricture. In this way, and thus only, he says, can we have an assurance of avoiding the most serious consequences. He illustrates the danger attending the removal of much urine in cases of chronic retention, by reciting a fatal case which came under his observation. In this case a man was admitted to hospital, suffering from acute retention of urine, caused by the effects of a debauch, superadded to an old and contracted stricture. After various and futile attempts with elastic catheters, a small, conical, silver instrument was introduced into the bladder, the effort occasioning trifling hemorrhage from the urethra. Nearly four pints of urine were evacuated. The catheter was used three times daily for two days, at the end of which time the patient had regained the ability to void urine. It had been decided to dilate the stricture, when, upon the third day

after admission, the patient had a severe chill, followed by fever, prostration, and the usual symptoms of the so-called typhoid condition. The urine became scanty and bloody. At the end of a week he died. The autopsy showed no recent lesion at the seat of stricture, but a hypertrophied bladder with well-marked trabeculæ, and a diverticulum just at the right edge of the trigonum, dilated ureters and pelvis. The bladder-wall was soft, swollen, and contained numerous abscesses, from the size of a pea downward; there was a perivesical inflammation, and a collection of pus between the bladder and rectum. The mucous membrane of the bladder was swollen, soft, injected, and at several places eroded. The kidneys were engorged with blood, and showed under the microscope numerous miliary hemorrhages. In short, the case was one of cystitis and pericystitis in an hypertrophied and habitually distended bladder. The cause of the inflammation was not nervous reflex action, nor injury to the urethra, but the immediate evacuation of all the urine contained in the bladder, or the use of an unclean catheter, or both, a result which might have been avoided had the catheter been carefully cleansed before introduction, *and withdrawn when half of the contents of the bladder had escaped.*

The case quoted by Sir Henry Thompson is another illustration, though in this fatal syncope followed the evacuation of six pints of urine from the bladder of an old man subject to chronic retention. The fatal syncope was, doubtless, due to the rapid removal of so large a body which had previously pressed on the abdominal veins and viscera.

If further evidence were necessary to illustrate the greater danger attending operations upon the urethra in those suffering from chronic retention, but more especially the fact that urethral fever, etc., so-called, to a greater or less degree, follows invariably operations upon this tract in such cases, the four cases reported by Swinford Edwards ("Annals of Surgery," vol. iv., No. 1) might be cited; also many others; literature abounds with similar cases. Of Dr. Edwards's cases, three were fatal, one recovering after a severe illness of a month or more, during which he was delirious at times. All were more or less subject to chronic retention, though one case was complicated by pyæmia following the operation. I will here briefly refer to their clinical history.

Case I.—E. E., aged 22, a laborer; had difficulty in passing water for three years, during which time he has had retention four or five times. He attended as an out-patient at the West London Hospital for stricture. Previous to admission several attempts had been made to pass an instrument, but without success; "in fact, the manipulation must have been pretty severe, for he was bleeding from the urethra when first seen." As the house surgeon was unable to pass a catheter, no further effort was made, but the patient was sent to bed and ordered a hot bath. After this a railroad catheter No. 4 was passed, and four pints of urine drawn off. He had a severe rigor the next day, and died at 11.20 the following morning. At the autopsy a false passage was found.

Case II.—Aged 65; a history of stricture of nine years' duration; had been in the habit of passing a No. 7 French catheter. Three strictures of urethra, one subpubic. They were treated by gentle dilatation; after meatotomy (one week after), he died on the fourth day. In the membranous section were found two false passages.

Case III.—J. K., aged 31; with a dense, tight stricture four and a half inches from the meatus. He had suffered from stricture and occasional retention for five or six years, and for which external urethrotomy had been performed in the German Hospital three years previously. Internal urethrotomy by Dr. Edwards. After each act of micturition, patient sick. On the fourth day after operation, rigors developed, also high temperature. He died on the fifteenth day.

Post-mortem.—Kidneys more than normally vascular; a large congested patch in one; bladder somewhat dilated, but showed no signs of inflammation, etc.

In classifying these cases, Dr. Edwards puts the first under the head of acute urethral fever, caused by absorption of septic products, though nerve irritation, he thinks, may have played some part in the tragedy. The second case also he would place under the foregoing head. The three elevations of temperature which were manifested in this case, he says, were distinctly due to the instrumentation, and he believes the disease was caused by the local irritation of the nerves supplying the membranous and prostatic urethra, causing dilatation of internal vessels by reflex action. The death of the third case he believes was the result of pyæmia. It undoubtedly complicated the case, to say the least. The evidence of this was the pneumonic abscesses containing sanious pus, and

the plugging of the veins leading from the prostate to the internal iliac.

Regnald Harrison, in the Lettsomian lectures for 1888, in speaking of internal urethrotomy and urine fever in his first lecture, says, "Here an incision, limited to a few lines in length, is made in the urethra, which the patient for two or three hours is probably unconscious of. Then he is seized with a rigor, which terminates in fever and an elevation of temperature. As a rule, these symptoms decline in the course of a few hours, possibly to be repeated. More rarely the rigor and fever are followed by suppression of urine, convulsions, and speedy death, post-mortem examination failing to discover any reasonable or recognized explanation for these phenomena. These symptoms in slight degree, as a rule, more frequently follow internal urethrotomy, accidental wounds of the urethra, and the introduction of a catheter or bougie. Even the last-named operation, simple as it usually is, has proved fatal in the course of a few hours, with little or nothing to show in explanation. Here, then, as I have said before, we have a train of symptoms resembling ague, which are only called into existence in connection with lesions involving the urinary tract." He relates several very interesting and instructive cases. One, a young and healthy male, upon whom he had performed internal urethrotomy, was taken three hours afterwards with a rigor, followed by high temperature, convulsions, and suppression of urine, and in forty-six hours he was dead. Post-mortem proved nothing but that the operation had been properly performed. Another case, a boy, 11 years of age, ruptured his urethra by a fall, and had retention of urine for thirty hours before he visited him in consultation. A catheter was passed with some difficulty along the lacerated canal and retained, the retention of urine being in this way relieved. On the following morning he was found to have a temperature of 102° F., and to have passed a restless night. About four o'clock that day he was taken with severe convulsions, and was absolutely unconscious, his temperature being then 105° F. The fits recurred with much violence, attended with opisthotonos. He became comatose, and died at midnight, twenty-four hours after he first saw him and the catheter was passed. He remarks: "I could not help observing, so long as this patient had retention, he was comparatively safe; but, when an opportunity was afforded to the urine of coming and continuing in contact with the lacerated urethra, a process of acute poisoning seemed to commence, speedily terminating in death."

In 1874 a healthy middle-aged man was under his care for a tight urethral stricture, for which, in the course of treatment preliminary to dilatation, a metal instrument carefully passed was followed by some very slight bleeding. Four hours after, he had a rigor, with temperature of 103° F. This was followed by a succession of rigors, at intervals of from eight to twelve hours. For over fifty hours the amount of urine excreted was only four ounces. Pulse was quick and thready; the tongue dry and brown; there was occasional delirium. He recovered after ten days. He remarks further: "Illustrations such as these and others that I could quote seemed to indicate that the presence of urine in a wound, under certain circumstances, was capable of generating an aguish form of pyrexia, which I shall speak of henceforth as urine fever. I am aware that some authorities are accustomed to speak of all the phenomena I have just illustrated under the one name of urethral fever. Such a term I think misleading, inasmuch as it seems to connect the symptoms produced with the precise part rather than with the process, for wherever throughout the urinary tract urine can be placed under certain conditions, there can all the phenomena usually associated with the term urethral fever be produced." Believing that urine fever might be traced to the kind of contact existing between a wound and the urine, he concluded to test it in the following way: "Taking a number of cases of subpubic urethral stricture, which were unfitted for treatment by dilatation, I adopted the following procedure: Internal urethrotomy having been performed, and all obstruction being removed, so that a full-sized grooved staff could be placed into the bladder, the patient was placed in the lithotomy position, and a median cystotomy performed,—quite independent of the previous internal operation,—so as to admit a full-sized drainage-tube, such as I usually employ for this purpose, to be passed into the bladder. By this combination of internal and external urethrotomy, I treated a considerable number of urethral strictures of the worst type, with results which time has already shown have been eminently satisfactory, both so far as the immediate comfort of the patient was concerned and the permanency of the relief that was afforded. After a number of trials of this kind, I soon found

as was my drainage so was my freedom from fever; urine fever only occurred where the former was imperfect. When urine, even in very small quantities, was pent up in a recent wound, fever resembling ague invariably followed. When, on the other hand, urine was allowed to escape freely and continuously,—as after a lateral lithotomy,—no such symptoms were developed. It was further observed, with much uniformity, that in cases where it was impossible to obtain perfect urine drainage, the urine might, so to speak, be sterilized by local or general measures. This tended considerably to prevent the urine undergoing changes and yielding products which were calculated by their absorption to produce this special kind of fever."

He urges the great value of solutions of corrosive sublimate for injection into the urethra and bladder, both before and after internal urethrotomy; and observed that, after the above operation, the production or not of urine fever in some cases could be largely influenced by the administration of quinine. Boracic acid, it appears, is of great value as well. He refers to the statement of a recent writer, who in forty urethrotomies had but one case of urine fever, in which the precaution of sterlizing the urine by the administration of boracic acid had been accidentally omitted. He believes the disease to be essentially the result of an entrance or absorption into the system of an animal alkaloid of urethral origin, and refers to the researches and writings of Gautier, Peter, Bouchard, Brunton, and Brown concerning the development of animal alkaloids, both in the dead and living, in support of that belief. From the foregoing he takes the following deductions:

1. That the presence of urine in relation with a recent wound is necessary for the production of what is spoken of as urine fever.

2. That mere contact of urine with a wound is not sufficient for its production.

3. That the retention of fresh urine within the area of a recent wound is almost invariably followed by its development in a greater or lesser degree.

4. That when urine is placed under such circumstances, as have been last mentioned, the liability to the development of urine fever is greatly diminished when it is sterilized by local or general means.

5. That the retention of fresh urine, blood, and the *débris* of damaged tissue in the confines of recent wounds for a certain time, at a temperature of somewhere about 100° F., could hardly be possible without chemical changes taking place in the constituents referred to.

6. That there is a common origin for urine fever is rendered probable by the uniformity of the symptoms attending it, which, though differing in degree, are identical, whether following a surgical operation or *an accidental wound.*

Another fact of the utmost importance, to which he has directed attention, is that cases of rupture of the urethra, sequent upon injuries of the perineum, do best when treated by perineal section, with insertion of tube, and drainage of the bladder by that means, without regard to extravasation.

He says, "Where the canal is more or less lacerated, we see exemplified the most disastrous effects of permitting a wound to heal, subject to the irritation that constant contact with pent up urine is capable of exercising. Fortunately, as a rule, in these cases, retention of urine for a time averts the liability to acute septic intoxication."

Lydston has recently, from a clinical standpoint, divided the disease into six forms, a classification which seems rather far-fetched. He says, "The relation of organic and functional disturbance of the kidneys to urethral fever is a most intimate one. There is probably no case of obstructive disease of the genito-urinary tract, of long standing, which is unaccompanied by functional disturbance of the kidneys, and, in a large proportion of cases, there occurs later on actual organic change in the renal tissues. This condition of affairs is to be anticipated and given serious consideration in every case of chronic urinary disease. The immediate effects of the kidney difficulty may not be marked, because of the activity of vicarious elimination by the skin and bowels, the vicarious action of these structures constituting the means by which the system accommodates itself to the imperfect elimination of the constituents of the urine."

He records the following case in which sudden death followed operative interference with the urethra. One of his personal friends had performed urethrotomy upon an apparently healthy young man of 28 years of age. The stricture was located about three-quarters of an inch posterior to the meatus, and was divided under cocaine without any difficulty or pain whatever. A sound was passed every second day thereafter, each operation being preceded by the injection of a four per cent. solution of cocaine, the quantity used

being about two fluidrachms. About a week after the urethrotomy, the patient complained of considerable nervousness and insomnia, but this was not considered of any particular importance. On the ninth day an attempt was made to perform the usual operation of sounding and injection of cocaine, the patient meanwhile lying upon an ordinary surgical chair. The doctor left the patient for a moment, to obtain his sound and give the cocaine an opportunity to affect the urethra. He was called back in about a minute by the patient, who complained of dizziness, and immediately fell back on the chair in convulsions. Assistance was called, stimulants given, and the galvanic current used, but without avail, the patient dying in less than five minutes. At the post-mortem a thorough examination of all the vital organs was made, but everything was found perfectly healthy, with the exception of the kidneys, which were so extremely congested that they presented a bluish appearance, similar to that of the spleen. This fatal result, he says, was not attributable to the cocaine, but was evidently due to the sudden explosion of poisonous material, which had been gradually accumulating in the system, as a consequence of imperfect action of the kidneys, and the metabolic action of slight surgical shock upon the tissues. This condition of toxæmia gradually grew more pronounced, and was finally so severe that a comparatively slight irritation was sufficient to inaugurate a nervous explosion. Such an irritation was afforded by the mechanical effect of the injection of the cocaine, and it is probable that the introduction of simple water would have had a similar effect. The danger of the development of urethral fever is directly proportionate to the distance of traumatic or surgical injuries of the urethra from the meatus.

On the other hand, Dr. Nicholas Senn believes that as urethral fever, so called, follows injury to the urethra so rapidly, and only in persons whose nervous system is predisposed to it, there can be no doubt that it is only a manifestation of disturbance of the vasomotor nerves.

Dr. Roswell Park believes that the cause is to be found in the absorption of some poison—probably a ptomaïne—contained in the urine flowing over a wound; and this wound is usually a pretty fresh one, since a healthy granulating wound does not absorb nearly as well. For instance, we frequently see after external urethrotomy, that so long as a tube lies in the wound through which the urine can flow freely, no such fever supervenes; but if the tube be removed on the second or third day, before granulations have had time to form, so soon as the urine flows through the wound and comes in contact with its surface, for a day or two there will be more or less fever, sometimes quite high.

Mr. W. Mitchell Banks, in his clinical notes upon two years' surgical work in the Liverpool Royal Infirmary, referring to Holt's operation, says, "The majority of patients have certainly an attack of urethral fever for a day or so after its performance, but this can always be reduced to a very trifling matter, or even staved off altogether by the use of quinine and opium. On the morning of the operation the patient had two grains of quinine and a grain of opium, and after it two grains of quinine every two hours for perhaps five or six times. A great many of our patients in Liverpool are sailors, who have had African malarial fever, and they all declare that an attack of urethral fever is exactly the same thing in all its phases as a malarial attack, only rather sharper. These men invariably have the attack after dilatation, while others, who have never been abroad, often escape. The two forms of seizure being so absolutely identical in their phenomena, quinine, the specific for one, seems the most appropriate remedy for the other." Further, in reference to internal urethrotomy and the treatment of stricture, his ideas are worthy of repetition, and have been recently endorsed by Regnald Harrison. He says, "Of internal urethrotomy, except as applied to the meatus or the penile urethra, at a short distance from it, I confess I have considerable dread. This arises from having seen two thoroughly healthy men die from it in the hands of other surgeons, who certainly would not have died if they had been treated, say by gradual dilatation. The operation in each case was quite well done, but the patients died with symptoms of septicæmia. Now, this is a very dreadful thing, and I would rather have any number of patients wait a little longer for their cure than be subjected to so serious a risk. For, after all, everything that is accomplished by the urethrotome can be accomplished by the bougie or Holt's dilator; while to the very worst cases it is not applicable at all, and for them we have to fall back on Symes's external urethrotomy. I have treated a great many strictures, but I never, I am thankful to say killed anybody by treatment, and I entertair

a very strong view that nobody need be killed in the curing of his stricture, seeing that patience will ultimately triumph over all difficulties. I confess I may be somewhat prejudiced against internal urethrotomy, but the occurrence of the two catastrophes alluded to certainly shook my belief in it."

The following case occurred in my own practice:

J. H., aged 38, consulted me, December, 1887, with regard to the treatment of his urethral stricture. He said his trouble originated three years previously, at which time he suffered from acute retention of urine. He said the physician who attended him then forced his way into the bladder with a small sound. After the withdrawal of the sound, he bled profusely. Since that time, he says, he has not been able to urinate so freely as before. When I saw him he was urinating every half-hour, and passed but little urine after much straining. His meatus was much smaller than the average. Strictures were located as follows: quarter of an inch, three-quarters, and two inches from the meatus, all of which were of small calibre; these were dilated to No. 15, F. There was also a tight stricture of the membranous urethra. The meatus was cut at the time the strictures were dilated. It was my intention to perform internal urethrotomy later on. I was in hopes that with stretching and cutting of the strictures in front, some instrument might be gotten through the deeper one, which at this time was impervious to the filiform bougie.

The subsequent status of the case is as follows: Within eleven hours subsequent to the stretching of the strictures and cutting of the meatus, he had two rigors, and for three days he had two rigors in each twenty-four hours; as a matter of course each rigor was followed by high fever. After this they recurred but once in the twenty-four hours for two weeks. From this time on the intermissions were more marked, ceasing entirely eight weeks from the beginning. Twice during the first three weeks his temperature, subsequent to the rigors, rose as high as 105° F. Upon six occasions he was slightly delirious, and constantly complained of severe aching pain in his back. His urine, though examined thoroughly at different times, was comparatively normal.

For a week his condition was quite alarming. From the first large doses of quinine were given, and gradually increased, until, shortly before his recovery, he received, hypodermically and internally, about one hundred and ten grains of the bisulphate of quinine in the twenty-four hours. Several times as high as 60 grains of quinine were given in anticipation of a rigor, and, despite the huge dose,—the greater part (40 grains) of which was given hypodermically,—they recurred invariably. The whole canal, as far as the deep stricture, which had not relaxed any, was then injected by means of a catheter and syringe with corrosive sublimate 1 to 40,000. This change was made a few days previous to the last large dose of quinine. No rigors followed this change.

He continued to inject the urethral canal after each act of micturition. In the fourth week of his illness he was able to be up and walk about some. His ability to urinate had gradually improved during this period. He was now able to pass a greater quantity of urine at each act of micturition and retain his urine longer.

When I saw the patient last he said he was able to urinate freely, and could retain his urine so long as he desired. In this case all operative interference was done under thorough local antiseptic precautions. No antiseptic was given internally. The entire subject may be summarized as follows:

1. In operations for the relief and cure of chronic retention of urine, the complete evacuation of all the urine at first should not be permitted, but rather the withdrawal of only a few ounces, and the immediate injection of a solution of boracic acid or other mild antiseptic, in volume equal to one half the quantity of urine withdrawn, lessening with each succeeding injection the quantity of fluid thrown in, and increasing the amount of urine withdrawn. Thus, by regular gradation the bladder is emptied, and the circulation, in its abnormal walls, is accommodated by degrees to the new order of things. The same may be said of the ureters and kidneys. As a result, we have less shock, if indeed any; no suppression of urine; no hemorrhage from the urinary organs; and slight, if any, urine fever, so called.

2. Tight strictures of the membranous urethra are more successfully, and hence more safely, dealt with by perineal section. When associated with strictures of the pendulous urethra, the combination of internal and external urethrotomy is undoubtedly the best treatment.

3. The decomposition of blood, urine, and other organic matter in the bladder or urethra, may give rise to the phenomena through

the production of ptomaïnes; hence the necessity for antiseptic treatment, generally and locally.

4. The disease is more common among those who are predisposed to it by the nature of a peculiar nervous temperament.

5. In view of the fact that more or less shock attends all urethral operations, especially the forcible and rapid dilatation of old strictures with sounds; and as sudden death has followed even the gentle insertion of a sound, the calibre of which was less than that of the stricture, it is hence important that all practical precautions should be observed in every case of dilatation of a urethral stricture or strictures, with a view to avoiding, so far as possible, such effects, that unhappy sequel being more liable to follow rapid dilatation of old strictures when not preceded by internal urethrotomy.

6. It is also important to ascertain the condition of the bladder, urine, and kidneys before operating for stricture of any degree, and when these two organs are found extensively diseased, the greatest skill, gentleness, and patience is necessarily called for in the treatment of strictures. Further, when these organs are diseased, and we have to deal, in a given case, with several strictures of very small calibre of the pendulous urethra, two courses compatible with safety are presented, —viz., gradual dilatation alone, or internal and external urethrotomy, leaving a few days between the internal and external operation, the latter being done first.

7. Quinine, in any quantity, exerts no manifest influence over the course of the disease.

8. Boracic acid, internally, by its resolvent and antiseptic action, doubtless does exert a favorable influence upon the disease, and will prove a prophylactic if given some days before operating.

9. With a further view to prophylaxis, both before and after all operations upon the urethra,—even simple catheterism,—the canal should be injected with some mild antiseptic. This is more essential after each act of micturition, subsequent to internal urethrotomy.

10. When urine fever persists despite all treatment, or should, after any operative interference with the urethra, jeopardize the patient's life, perineal section should certainly be done.

11. I believe the disease in some instances to be one resulting from the escape of micro-organisms into the circulation. In others it is due to the absorption of their products at the points of operation. It is probable that in some cases the absorption of these products, and those of tissue disintegration, takes place at different points throughout the genito-urinary tract. In other words, in some it may be a septicæmia, in others a sapræmia. I think, so far as our knowledge goes, we may have both acting at one time.

DR. GUSTAF ZANDER'S MECHANICO-THERAPEUTIC INSTITUTE IN STOCKHOLM.

By Kate C. Hurd, M.D., Stockholm, Sweden.

THE term "health gymnastics" has originated of late as a sort of synonyme of the old word massage, and it includes all the now more fully developed principles of the latter. It comprehends both massage and active movements.

In Sweden, from the beginning of the present century, most careful attention has been paid to massage and to gymnastics, but there, as in other parts of the world, too often the masseur has had but little knowledge of the physiological principles underlying the *technique* of his art, and has promised more than he has been able to fulfil.

There has been another difficulty in the way. Physicians have not been sufficiently acquainted with the rules, theories, text-books, and claims of health gymnastics to give intelligent direction in this line of treatment, and they have too often trusted their patients to the hands of mere pretenders, who have done them no good. Hence it is that health gymnastics have been undervalued the world over by medical men, who have not taken the pains to understand them, while some of the laity have exaggerated the importance of these gymnastics, and the quacks have reaped the benefit of the disrepute into which the movement-cure has fallen.

To-day the best representatives of the healing art in Europe and America, realizing that the preservation of health and the prevention of disease by hygiene and exercise are of more importance than the mere administration of drugs to the sick man, are becoming interested, as never before, in health gymnastics. The day of nauseous doses has well-nigh passed away, and the memory of absurd therapeutic systems of by-gone times must fade into the twilight of tradition as the

medical world comes to appreciate the value of hygiene, hydrotherapy, electrotherapy, and exercise—I may add, as more correct habits of living prevail.

Institutions for health gymnastics in Europe are numerous. These belong to two schools, which, unfortunately, are continually in antagonism, although they ought to work in harmony. One of these is the mechanical school, of which I shall speak later. The other school employs only free movements, with little or no apparatus for its patrons who are strong, and in good or moderately good health; it also conjoins passive movements by the hand for patients less strong or suffering from some acute or chronic disease. There are numerous institutes of this kind in Europe, and especially in Sweden, the great centre and originating source of the massage schools.

The best institute for manual orthopedic massage in Stockholm is under the charge of Dr. Wide, who has made a long and earnest study of "orthopedics" in all its varieties, complications, and possibilities. In accordance with physiological and mechanical principles, each case is treated *per se* after a careful and minute examination and diagnosis. Dr. Wide himself writes the prescriptions for each patient, which consists of ten or twelve movements, to be given during each morning for a month. At the end of this time he re-examines the patient, and makes any alteration in the prescription which may be necessary.

At this institution, during the morning hours for women and children, an average of sixty patients are treated each day. The size of the three large rooms limits the number to seventy. Dr. Wide employs during these two morning hours ten female masseurs for the general manipulations, all of whom are graduates of the Central Institute, while any specially difficult or delicate movements, which require an intimate knowledge of the physiology, anatomy, or pathology of the diseased organ or tissue, are performed by Dr. Wide's first assistant, who is also a graduate physician.

In severe cases of spinal curvature, or of coxalgia, the patient wears, between the times of treatment, a corset, *made at the institute*, for his or her special case. Some of these corsets are made of thin wood, which, after a thorough soaking in water, can be easily moulded to fit any curve, and to this are adjusted any necessary straps, bands, or elastics for special tension; and generally an iron corset-fastener is attached to the front to increase the stiffness.

Many of these corsets are of light felt, and one of the newest varieties is of cambric, thickly starched, amply fitted with steels and rubber bands just where there is an indication for additional pressure. These are cool and light, and give good comfort and satisfaction to the unfortunate children who must wear them.

Plaster of Paris is used for corsets when absolutely necessary, also the *jury mast*, and many of the American orthopedic inventions. It is very gratifying to find everywhere in Europe that the American orthopedists are held in such high repute.

The real founder of the Swedish movement-cure was P. H. Ling, who, some seventy years ago, devised the physiological and rational system of health gymnastics, which (with modern improvements) is so much in vogue to-day.

Gymnastics, considered as exercises of hygiene for strong and healthy persons, are well systematized in the German "turn schools," and the *Turn-Lehrer* is an admirable hygienist. The German system is, however, too severe for use as a therapeutic agency.

Any institute of massage, to do effective work, must, of course, be under the direct supervision of a competent physician.

The fundamental difference between the German and Ling schools is that the former employ *general*, the latter *special*, movements for particular muscles and groups of muscles. Both are based on anatomical and physiological principles, but does it not seem reasonable that, as far as gymnastics for the sick are concerned, much more good can be accomplished by the special method of Ling than by the general method of the German school?

It may be said that few physicians have the necessary time or strength to practise long series of movements on numbers of patients every day; this is especially the case with the busy general practitioner. It goes without saying that Swedish movements, especially when associated with hydrotherapy and electrotherapy, demand much time and patience, as well as almost continuous in-door confinement.

There is only one way out of the difficulty. If the Swedish movement-cure is good for anything, it must be practised by specialists. The general practitioner must understand the method, and must be able to indicate the needed movements in particular cases, but he must employ skilled and experienced mas-

seurs to execute the movements. I realize the fact that good masseurs are scarce.

It may even be necessary to obtain an expert, with a diploma, from one of the Swedish schools; such duly qualified specialists are ready to come to America whenever sufficient encouragement is given. At the Central Institute in Stockholm there is a two years' course in massage and free gymnastics, under Dr. Levin and Dr. Murray and other competent teachers. This course is open to fifty young men and women every second year, and is quite free. At the end of the two years the students graduate, having had a thorough course in massage, having treated a large variety of diseases at the clinics, such as nervous diseases, muscular, skin, circulatory disorders, and nearly all other chronic functional or organic disturbances. They are required to do much dissection, and recite anatomy every day; they study physiology and hygiene, and have many special lectures. Moreover, they acquire a love for the work, which sometimes leads the young men to feel that they can confidently diagnosticate and treat all diseases; but a word of praise is certainly due the young women, who are generally more aware of their proper sphere; and physicians find that they can commonly rely on their patience, earnestness, and conscientiousness in their work. It is not, however, possible always to find the good assistant who is sufficiently strong to treat many or all cases. He or she becomes weary because mortal, and at some times can work better than at others, however desirous of always being at one's best.

With these difficulties in view, Dr. Zander, of Stockholm, in 1865, conceived the idea of replacing the gymnast by *machines*, which could always be in order, could be evenly regulated to the amount of force required each day for each individual, and would never be fatigued. These machines would also be much cheaper in the end, and many times the usual number of patients could be treated in an hour.

Dr. Zander has naturally been often asked, as doubtless many are asking now, what he considers the chief relative advantages and disadvantages of the *mechanical gymnastic system* and the *Ling system of hand massage?*

To this question he replies by a long letter, printed in Dr. Hermann Nebel's "Bewegungskuren, mittelst Schwedischer Heilgymnastik und Massage,"* Frankfort-on-the-Main, 1889, of which there are a few sentences that I may quote here:

"Physiology teaches that the law of organic development is that of gradual growth. An increase of muscular strength is not possible unless the work done which causes the increase in growth is proportionately increased, and is adapted to such development from the first. Neither the muscle nor its work must lose this relation, otherwise wasteful expenditure results. . . . Therefore it is necessary, in prescribing a passive or active movement for a certain muscle or group of muscles, that one should know just what the 'lift' is, and its relation to a certain weight. This can be easily determined by means of weights in the carefully-graded machines. If at one time the muscle power is greater or less than at another time, having once determined the standard, it is very easy to increase or diminish the leverage of the weight."

Cannot this be done equally well by the manual massage?

Dr. Zander answers no, "Because the resistance of the machine is so carefully adjusted to the maximum and minimum of the amount of force displayed, and is marked by a fine scale, which never varies."

According to the principles of the lever, the effect of a movement is always strongest at its middle point, and as the movements of the body are all those of levers, it seems reasonable that a machine, consisting of a weighted lever carefully adjusted, parallel as far as possible with the human lever to be exercised, must give the proper kind of a movement,—*i.e.*, least at beginning and end, and greatest at the middle.

It would be almost impossible for a masseur to adapt his strength exactly to the varying strength of the patient, or to give the muscles their exact action every day, as his own muscular powers vary with his fatigue.

A Zander lever-machine can easily remedy this fault, as above stated. The patient always holds his prescription-card in his hand, on which is marked the strength of the movement on the day of examination, and from that mark as a guide the experienced assistant can raise or lower the weight, as seems expedient, in proportion to the strength of the patient. A machine which depended for action upon a spiral spring could not be made to answer this purpose, for with a spring the strength of the movement is greatest at its end. The motion is always

* "Movement-Cure combined with Swedish Health Gymnastics and Massage."

smooth and even, the lever of the left side is as strong as that of the right side, which is not apt to be the case with the hands of a masseur.

By the mechanical method not only can the strength of the muscles be determined, but also the power of the heart and respiration. If by the movement the heart is much increased in rapidity, or is made irregular, or if the respiration is not slow and even, then is the movement too strong, and it can be diminished to the proper point. Again, if the movement seems very light in the morning when taken, but is followed in the evening by any unusual weariness, the resistance must be lessened on the following day, for a movement given badly, or out of proportion to the needed strength, can only be productive of harm.

Dr. Zander, of course, must employ masseurs to give movements by hand as well. There are many cases where the machine must be supplemented by the hand, especially if the patient be feeble or suffers acute pain from some motion of the machine.

The machines are divided into three classes, giving—

1. Active movements, requiring more or less effort on the part of the patient.

2. Passive movements, in which the patient is simply operated upon by the machine, as in the various processes of chopping, hacking, rubbing, shaking, trembling, kneading, etc. These latter are all moved by a powerful (12-horse) gaso-motor.

3. Machines, mostly passive, exclusively for orthopedic treatment. Their essential *modus operandi* for treatment of scoliosis is as follows: The patient reclines or lies in such a position as to obliterate any deformity as much as possible; at the same time irons press against the convexities of the spinal curves, with a given power or weight. This position is continued for periods of five minutes several times during a morning, and most remarkable results, in the complete cure of scoliosis of long-standing, have been derived from this application of mechanical principles to pathology.

The active machines are simple in construction, all made of cast iron, and their weighted levers are very delicately adjusted and finely graduated as to scale. (See Fig. A, which is one of the machines for arm adduction.) With all of the movements it is essential to take deep and regular respirations.

Fig. B, for foot-rolling, exercises all of the extensor and flexor muscles of the ankle; the blood is made to circulate well through the whole foot.

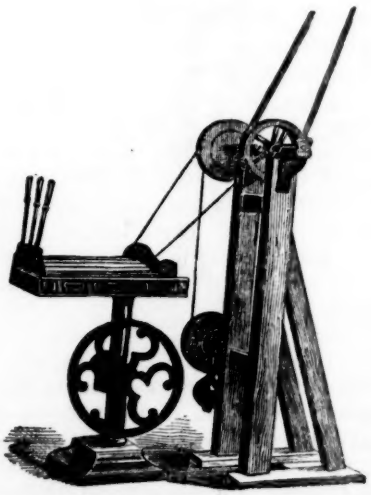
The machine numbered C is for move-

FIG. A.

ments of the trunk. (See Fig. C, which exercises the muscles of trunk and abdomen.)

Fig. G is one of the passive machines, for

FIG. B.

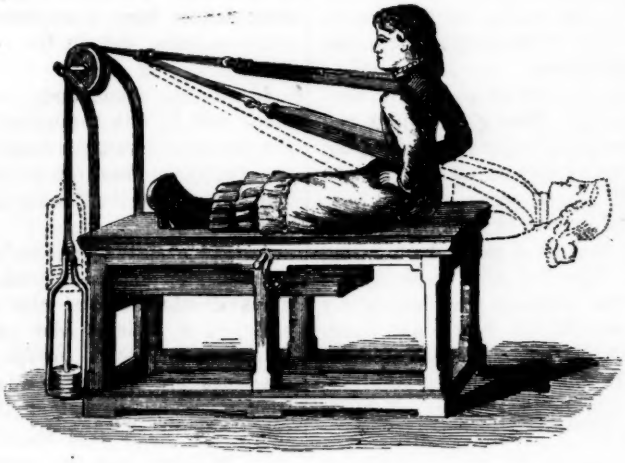


chopping or hammering. These give good surface circulation, soothe aches, and stimulate the whole body.

The vibratory machines are especially good for tired nerves and muscles, for cold feet, for an aching back, and cause the heart to beat less rapidly, owing to the lessened pressure of the blood in the great vessels.

Other machines, like the movement of horseback-riding, are thought to be beneficial in reducing adipose tissue.

Fig. C.



Trunk-rollers are good as strengtheners of the abdominal muscles; at the same time they increase the abdominal circulation and intestinal movements.

Fig. G.

Every prescription contains near its end a respiratory movement, given generally by a large passive machine, which consists of two curved pieces of iron, which, by the raising or lowering of the stool on which the patient sits, are made to fit under the axilla; there is also a cushion, which presses on the back between the scapulæ. When the machine is set in motion, the two under arm-pieces pull slowly upward and backward the axilla of the patient, and with this naturally the whole *length* of the chest is much increased; the cushion presses on the back to increase the *breadth* still further. This motion is given in a slow, respiratory rhythm, and a patient cannot do otherwise than take good, deep, full inspirations. No superficial or uneven breathing is possible, and only very occasionally is a masseur found who can give this movement as well as the machine.

There are a few general rules for prescribing the movements, which Dr. Zander's experience has taught him. The exercises are arranged in groups of three, with a period of five minutes for rest between each group. One of these three may be an arm movement, one a leg movement, and one a passive or orthopedic movement. If a patient is strong, he may have a third active movement, or, if weak, a second passive movement. At the commencement, the movements are taken very lightly, and if at any time of the day following excessive fatigue is felt, the movement is diminished in force.

On the prescription card is given the number of the machine, the weight to be used, and any direction as to position. In case of a scoliosis, the patient probably requires one of the variously-angled wedge-shaped seats to be placed on the stool of the machine while he takes his movement. All of these points as to the mechanical rules Dr. Zander indicates carefully in the prescription, and his competent assistants are faithful in carrying them out.

Often there is a case of nervous prostration

where the patient experiences great fatigue and neuralgic pains after the first day's movements, and for a month, perhaps, there seems to be little improvement; when, quite unexpectedly, there comes a relief from the symptoms, and the patient feels as well as after several months at a rest-cure. In such a case great care in the prescriptions must be taken, and often a rest-cure is needed first.

A patient may never drop a movement which seems to him useless or too severe, without the consent of the physician who has written the prescription.

The patient shall wear no corsets, no constricting-bands, shall take a glass of milk and a cracker before going to the gymnasium, but nothing more hearty may be eaten within an hour and a half.

The Zander Institute in Stockholm grew slowly at first, and, as a method of curing disease, it was regarded with suspicion for some time. The diseases most commonly treated now are chronic heart- and lung-diseases, catarrh of throat, stomach, and intestines, constipation, hemorrhoids, paralysis, joint-diseases, sprains, rheumatism, all kinds of deformities, etc.

One special machine for uterine prolapsus has been tried now for over a year, and has given very satisfactory results. It consists in a peculiar leg adduction with resistance, and the movement works especially upon the muscles at the floor of the pelvis and the vagina, strengthens also the uterine muscles and ligaments, and increases pelvic circulation.

One of the patients treated had been long troubled with a large prolapsus uteri. She had been variously "doctored," but without much effect. Her first prescription from Dr. Zander was very simple. It consisted merely in a *passive body-turning*, to give action to the muscles of abdomen and sacrum and lumbar region in particular; the second movement was a *sitting-leg-separation*, with resistance,—this one *active;* the third was *sacral* percussion; and the last was a respiratory movement.

No internal treatment was given, and from the beginning the uterus replaced itself in the vagina, and remained until forced down by some strain; the condition gradually improved, so that more and more severe strains were necessary to cause the prolapse to return; the prescriptions were increased in length and severity, the chief movements being still the leg adduction and abduction, and pelvis rotation, with sacral percussion. It is now three months since the first treatment, and only a very severe strain causes the return of the prolapsus. Dr. Zander feels confident that what has been done in this case can be done in most cases, and, if so, gynæcologists will welcome the machine.

Many young anæmic and chlorotic girls derive a great deal of benefit from the exercises, and many women during pregnancy take the movements. They find that their general health is much improved, and that their labors have been much easier than previous ones, and, in fact, relatively painless.

If with the sound body comes the sound mind, and if with the sound mothers come the sound children, the healthy generations, and happy families, for promoting that result alone would the Zander Institute receive worthy praise.

For the healthy child, the Zander machines are a capital means of producing a harmonious development of the whole growing body. For patients who need special development of special groups of muscles, the machines are admirably adapted; but for free, graceful, and rhythmical movements of the body, Ling's free standing gymnastics must be taken with the special movements of the machines, or after the body has been prepared by the latter for the balance movements of the former.

The Mechanical Institute of Stockholm contains ninety-five machines, thirty-five of these being duplicates of those most used. This apparatus is arranged in four large halls, full of windows and sun in its season. The machines are all nicely painted, and upholstered in dark green plush, making the rooms very attractive.*

* The apparatus of the Mechanico-Therapeutic Institute of Stockholm consists at present of sixty-seven machines, viz.:

Seventeen machines for active arm movements.
Eighteen machines for active leg movements.
Nine machines for active trunk movements.
Twenty-three machines for passive movements.

The passive movements are worked by a steam-engine of about 5 horse-power.

By means of these machines the following movements can be executed:

1. Flexion of the arms (at the elbow-joint).
2. Extension of the arms (at the elbow-joint).
3. Twisting of the arms (at the shoulder- and elbow-joints).
4. Flexion of the arms (at the shoulder-joint).
5. Extension of the arms (at the shoulder-joint).
6. Flexion of the hands.
7. Extension of the hands.
8. Adduction of the arms.
9. Abduction of the arms.

There are two physician's offices, a large and comfortable reading-room, a room for electricity and manual massage, a small room for the mineral-water, dressing and toilet-rooms.

The engine or gaso-motor is 12 horse-power, moving thirty-one or thirty-two machines.

There are at the institute three physicians, many instructors, also twelve boys and the same number of girls to put the machines in order, etc.

The institute is open from October 1 to May 15 daily, four hours for men and two or three hours for women.

There are now many Zander Institutes in Sweden and Denmark, Russia, and Germany, one in London, one in Baltimore, and one in Buenos Ayres. The manufacturers are now making a full set of machines for a promised institute in New York City which is to be in charge of a foreign physician, who has made a long and special study of the Zander Institutes of Europe, and hopes to rival the Friederichsbad in Baden-Baden, and the new Nebel Institute in Frankfort-on-the-Main.

The machines are never sold unless they can be controlled by physicians.

When the Institute opened, in 1865, it completed its first year with one hundred and thirty two patients.

During the past year (1888–89) six hundred and nineteen patients were treated for variable lengths of time. It is probable that wherever these institutes are opened, the growth and success will be the same, provided scientific and competent physicians have charge of them.

10. Upper and forearm extension of the entire arm directly upward.
11. Upper and forearm flexion of the entire arm directly downward.
12. Flexion and extension of the fingers.

13. Flexion of the legs (at the knee-joint).
14. Extension of the legs (at the knee-joint).
15. Twisting of the legs outward.
16. Twisting of the legs outward and inward.
17. Flexion of the legs (at the hip-joint).
18. Extension of the legs (at the hip-joint).
19. Flexion of the feet.
20. Extension of the feet.
21. Adduction of the legs.
22. Abduction of the legs.
23. Hip-knee-foot extension and flexion.
24. Hip and knee flexion.
25. Hip and knee extension.
26. Foot-rolling.

27. Flexion of the trunk (in the lying position).
28. Flexion of the trunk (in the sitting position).
29. Extension of the trunk (in the sitting position).
30. Extension of the trunk (in the standing position).
31. Twisting of the upper trunk.
32. Twisting of the lower trunk.
33. Lateral flexion of the trunk.
34. Extension of the neck.

35. Shaking of different parts of the body.
36. Chopping of different parts of the body.
37. Tapping on the head.
38. Kneading of the abdomen.
39. Kneading of the arms.
40. Rubbing of the feet.
41. Rubbing of the hands.
42. Rubbing of the back.
43. Rolling of the trunk.
44. Swinging of the trunk.
45. Balancing of the trunk.
46. Expansion of the chest.
47. Orthopedic pressures.

STRYCHNINE PILLS—ALKALOID vs. SULPHATE.

By H. F. Meier, Detroit, Mich.*

A PERUSAL of the article by Henry M. Field, M.D., Newton, Mass., in the Therapeutic Gazette for January, 1890, will undoubtedly have a tendency to some extent to shake the confidence, in this pharmaceutical preparation, of those upon whom we place our dependence in emergencies and disease. The physician, with his accumulated experience, is our only resource when it is desired to continue our physical existence beyond the period so frequently vexed with interferences, dangerous or destructive. The relation of current remedies towards our own organism assumes, therefore, an importance commensurate with the recognized life.

While the move of Dr. Field is certainly in the right direction, it impresses one with about the same sense of futility as is involved in the endeavor to convince the medical world of the advantage or superiority of quinine muriate over the sparingly soluble di-quinine sulphate.

The universe is full of faults; so is pharmacy; so is physic, particularly when presented in the form of pills, constructed as per the Pharmacopœia or accepted formularies. The endeavors of pharmaceutical investigators have for years been directed towards a reconciliation of the physical problems and difficulties presented with therapeutic requirements. It becomes a matter of pleas-

* Laboratory of Parke, Davis & Co., Detroit, Mich.

ure, therefore, to report upon the behavior of alkaloidal pills, and especially those of strychnine (alkaloid), as now obtainable from our American manufacturing pharmacists, who have devoted especial attention to the study of excipients and constituents with a view to attaining the highest possible state of perfection.

The pills tested were treated with the solvent indicated by Dr. Field,—that is, plain water and only a limited quantity. The testing apparatus described in the *Druggists' Bulletin* of July, 1889, was used for the purpose.

The solubility of powdered strychnine in water is stated to be 1 in 6700 parts of ordinary temperatures. The pills examined disintegrated entirely both shell and interior in from fifteen to thirty minutes at the temperature of the body. The fact of rapidity of disintegration being determined, further questions of solution and absorption can now be considered. Taking the largest size of pill examined,—$\frac{1}{16}$ grain,—the relation of the alkaloid to the fluids usually contained in the stomach at any one given time (say about 4 ounces) would be 1 : 28,000.

The fluids there present keep constantly changing, and we are justified in assuming that in apepsia the patient naturally imbibes water enough to supply the deficiency of customary secretion, should such a condition exist. A provision is thus made for the presence of enough fluid to insure results. An absolutely empty stomach is a thing unknown in the domain of physiology, unless the possessor is menaced by starvation,—that is, entire deprivation of food and water. As related to the professions of medicine and pharmacy, Dr. Field has really done both a service, because his article will tend to invite critical comparisons and needed investigation. The outcome will be simply the demonstration that modern pharmaceutical ingenuity has conquered existing difficulties, and that the alkaloidal pills, as now presented, are in the front rank, as far as their quality, permanency, and solubility are concerned.

Coming now to the practical examination, after demonstrating that pills can be made so as to disintegrate in the remarkably short time named, we are likewise able to show that an exceedingly limited quantity of fluid (one ounce used in the tester) will give a solution yielding all the characteristic reactions of strychnine. When the minute quantity of alkaloid ingested is presented to the fluid prevailing in the stomach, even if this be non-acid, its finely divided condition cannot fail to insure solution.

Tested from a physiological and chemical stand-point, very satisfactory results can be offered. The plain water solutions obtained with one ounce to one pill of $\frac{1}{20}$, $\frac{1}{30}$, and $\frac{1}{100}$ grain, respectively, after they had been agitated for thirty minutes at 100° F., were filtered, and giving evidence to the taste of varying degrees of bitterness, also gave precipitates with Mayer's reagent, differing accordingly in quantity.

It may be here noted that in applying Mayer's test, a number of organic substances are capable of influencing the result, either by increasing the quantity of the precipitate, or modifying its character. In comparing, therefore, with pure strychnine of known proportion to a control liquid, these facts must be taken into consideration.

After solution, the degree of dilution with the above pills would be: $\frac{1}{20}$ grain to 1 fluidounce 1 : 9600; $\frac{1}{30}$ grain to 1 fluidounce 1 : 24,000; $\frac{1}{100}$ grain to 1 fluidounce 1 : 48,000.

In testing with Mayer's reagent, the method of procedure was as follows: One of the pills is dissolved in a fluidounce of distilled water at the ordinary temperature. This is best effected by crushing the pill in a mortar, with the aid of a little pure white sand. If 10 c.c. of the filtrate are now treated with an excess (1 c.c.) of Mayer's n. 20, with the addition of two minims of acid sulphuric, dilute U. S. P., it will be found that the amount of precipitate or turbidity will correspond with that obtainable from a control liquid, prepared from an equivalent quantity of the sulphate.

Inasmuch as Mayer's reagent is a precipitant of albumen, being presented for the detection of this element in the form of test tablets for urinary examination, it should naturally be expected that vegetable albumen would also afford a precipitate. Such is really the case. I find that an aqueous dilution of quite a number of fluid extracts, which are known to be free from alkaloids, will yield, after dilution with water, filtration and acidulation, precipitates with the reagent named. Even an infusion of wheat flour 1 : 100 of cold distilled water, will yield a precipitate after slight acidulation. Also glucose, which is present in so many vegetable extracts, is capable of exerting an effect in modifying the results, so that extremely critical examinations or comparisons require, as a preliminary step, the isolation or separation of the alkaloid. This feature is, of course, already recognized.

Practical points in this matter, from which we can derive a deserved advantage are these: Having long ago recognized the existence of difficulties inherent to the toxic alkaloids, especially noticeable when presented in pill form, and which impose conditions pharmaceutically unfavorable, naturally the best energies and constructive ability of scientific experts have been taxed to surmount all those of a physical and chemical nature.

The superiority or excellence of a properly made strychnine pill is readily demonstrable without apparatus. If the particular pill under consideration (any size) be allowed to lay in water, kept at a constant temperature of 100° F., it will be found that in fifteen to twenty minutes the entire pill is resolved, without necessity of agitation, into a mushy condition. The nature of the excipient should allow free and ready absorption of water, thus providing for prompt disintegration. If we now test the structure or coherence of the pill, by gentle pressure with the end of a rod or stick, it will be found entirely soft and ready to present its contents to the gastric secretion or fluids, as the prescriber intended.

If we allow the occurrence of another natural factor,—that is, gentle attrition and propulsion of the contents of the stomach,—it is inevitable that solution of such a pill must ensue, and the intended effects be secured.

While such pills are obtainable, it is, therefore, needless to disturb a deserved confidence.

Regarding the cumulative action referred to, it should not be overlooked that this feature is inherent to the drug itself. The following extract from "Brunton's Pharmacology," pages 41 and 42, has a bearing on this side of the subject:

"If a substance be naturally so slowly excreted from the body that the whole of the dose in ordinary use is not excreted before another is given, the amount present in the body will gradually increase, just like the curare in Hermann's experiment, and will produce an increasing or cumulative effect. Examples of this are to be found in metallic preparations, such as those of mercury or lead, which are excreted very slowly, or in some of the organic alkaloids, if given in sufficiently large and frequent doses. The sparingly soluble alkaloids, which form stable compounds with the tissues, and are thus slowly eliminated, are more liable to prove cumulative." "Digitalin appears to diminish the secretion of urine, by causing a powerful contraction of the renal vessels, and in large doses may completely arrest the secretion of urine, and probably also the circulation through the kidneys. Strychnine has a similar action on the vessels."

The writer's personal experience with the remedy in question bears out the possibility of a cumulative action occurring, even when the salts of strychnine are administered in solution. Some years ago, having been directed to take elixir of calisaya, iron, and strychnine, in teaspoonful doses, three to four times a day, even at the end of ten or twelve days the medicine had become almost intolerable, owing to symptoms characteristic of strychnine accumulation, such as twitching of the muscles, an ineradicable bitter taste in the mouth, etc.

TREATMENT OF ACUTE PNEUMONIA BY INHALATIONS OF CHLOROFORM.

DR. PHILLIPI states that in a case of pneumonia occurring in an alcoholic subject, almost in the stage of dissolution, he has seen a remarkable improvement following inhalations of chloroform (*Bulletin Général de Thérapeutique*, January 15, 1890). The case was that of a man of 60 years of age, with a marked history of alcoholic intemperance, who had been affected with acute articular rheumatism for six years preceding. On the fifth day of his attack of pneumonia there was collapse, loss of consciousness, Cheyne Stokes respiration, cyanosis of the face, pulse small, irregular, and 96 beats to the minute. Subcutaneous injections of ether produced no reaction, and the author was led to the administration of a mixture of chloroform and alcohol. The patient at once made a number of deep inspirations, but there was a sudden arrest of respiration, and the chest was then rubbed with the mixture, and at the end of an hour there was no longer any appearance of cyanosis, the pulse was stronger, the patient regained consciousness, and collapse had entirely disappeared. The author administered in this way about two ounces of the mixture of chloroform and alcohol, and he attributes the rapid disappearance of these grave complications to the effects of the chloroform. The procedure is one, however, which seems to be attended by considerable danger, and it is doubtful whether, even in the reported case, the improvement was attributable to the inhalation, and not to the external use of the chloroform as a revulsive.

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EDITED BY

ROBERT MEADE SMITH, A.M., M.D.,
Professor of Comparative Physiology, University of Pennsylvania,

PHILADELPHIA.

GEO. S. DAVIS,
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Leading Articles.

THE REPORT OF THE HYDERABAD CHLOROFORM COMMISSION.

WE print on another page the conclusions to which the second Hyderabad Chloroform Commission has arrived from the prosecution of four hundred and thirty experiments on different forms of animals as to the mode of action of chloroform, the dangers attending its use, and the way in which it is stated these dangers may be avoided or overcome. The history of their results is an extremely interesting one, as they claim to overthrow all reasons for the belief, almost universally held in this country, at least, and to a great extent in England, as to the dangers attending chloroform narcosis. In 1888, Surgeon-Major E. Lawrie, the resident surgeon in Hyderabad, applied to the local government for the appointment of a commission to investigate the action of chloroform, as the result of his own experience and his physiological experiments proved that chloroform invariably arrests respiration before stopping the heart; and that if care be taken to either prevent the arrest of respiration or to commence artificial respiration as soon as natural respiration ceases, that death will never be produced by the use of this anæsthetic. The commission, after prosecuting a large number of experiments, announced, as the conclusion drawn from their work, that "chloroform may be given by inhalation with perfect safety, and without any fear of accidental death, if only the respiration is carefully attended to throughout."

As might be expected, these statements, not being based on fully published details of their investigations, and owing to their being directly contradictory to the results arrived at by the committees appointed by the Royal Medical Chirurgical Society and by the British Medical Association, and of such observers as Snow, Claude Bernard, McKendrick, and others, were regarded with considerable suspicion. The *Lancet* especially assumed a position of marked incredulity, and published several editorials and annotations, questioning both the reliability of the experiments and the justifiability of the sweeping conclusions which the Indian commission drew from them.

In a letter to the *Lancet* of May 11, 1889, Dr. Lawrie, while complaining as to the criticisms on the committee's work, called attention to the fact that, up to the time of his death, Syme taught that "we are guided as to the effect of chloroform not by the circulation, but entirely by the respiration," though he himself shows the difficulty attending the acceptation of this doctrine by the second statement that Erichsen teaches "that when fully anæsthetized the patient requires the most careful watching by the person who administers the chloroform; his finger should never be off the pulse, nor his eyes taken away from the countenance of the patient." These opinions of two most eminent surgeons are absolutely irreconcilable; one or the other must be totally right or totally wrong, and as Dr. Lawrie firmly believes that the principles taught by Syme are correct, he applied for the appointment of a second commission, which, in addition to the original members, should contain a representative appointed by the *Lancet*. The *Lancet* accordingly nominated Dr. Lauder Brunton, probably the most eminent teacher and experimenter in pharmacological work in England. Dr. Lauder Brunton's appointment is especially noteworthy, and the conclusions of the commission derive special importance from the fact that at the time of his appointment Dr. Lauder Brunton held views as to the action of chloroform directly opposed to the conclusions of the first Hyderabad Commission, since he

maintained that one of the dangers resulting from chloroform is death by stoppage of the heart.

The report of the second Hyderabad Commission is based upon four hundred and thirty different experiments made upon dogs, monkeys, goats, and horses. The conditions of the experiments were varied in every conceivable manner, some of the experiments being made on dogs just as they were caught, others at various intervals after having heavy meals of meat or farinaceous food or fat, others fasting, others after the administration of Liebig's extract of meat, coffee, rectified spirits of wine or ammonia. Most of these animals were healthy, but some of them had cardiac disease, and in many the heart and other organs were rendered fatty by the previous administration of phosphorus. In a large number of cases morphine, strychnine, and atropine, singly and in combination, were given by subcutaneous injection at intervals before the inhalation was begun. Chloroform was given with and without inhalers, in the vertical and recumbent positions, in glass and wooden boxes; in large and small doses, by being pumped into the trachea with bellows; and, in fact, in every way that could suggest itself to the commission.

The statement is made that in one respect the results were absolutely uniform; in every case where chloroform was pushed, the respiration stopped before the heart. Further, they found that if artificial respiration was commenced within thirty seconds after the cessation of respiration, it was nearly always successful. If it was not commenced within thirty to sixty seconds, it was very seldom successful, and always unsuccessful if it was not begun until after sixty seconds. They found that the success of artificial respiration in restoring the natural breathing was less constant after respiration had been stopped by chloroform in cases where a subcutaneous injection of morphine was administered before the inhalation was commenced.

Several other points brought out by their experiments are especially worthy of attention. Thus they confirm the statements very generally made as to the reduction in blood-pressure from the administration of chloroform, but they claim that this result, when the chloroform is given diluted in air, is a gradual one. This result therefore would seem to be in accord with the results attained by Bowditch, who attributes the low blood-pressure to dilatation of the blood-vessels produced by paralysis of the vaso-motor centre. There is another paragraph, however, of their report which does not seem thoroughly to be in accord with the sweeping character of their conclusions as to the safety of chloroform,—that is, that the involuntary holding of the breath, which must invariably occur when an inhaler saturated with chloroform is first applied to the face, will result in a sudden fall of pressure, with marked slowing of the heart, and the gasping respirations which succeed this holding of the breath will often cause a very rapid inhalation of chloroform, with immediate insensibility and a rapid fall of blood-pressure, which quickly becomes dangerous. It is true that the committee caution against the sudden application of undiluted chloroform, and would, perhaps, claim that these results could not take place if it was properly administered; but the very fact that such results can follow the very first inhalation of chloroform constitutes one of the dangers of this anæsthetic which has laid it open to such serious distrust.

On the other hand, they make the statement that failure of the heart, if such it can be called, instead of being a danger to the animal, will prove to be a positive safeguard, by preventing the absorption of chloroform from the lungs, and a more rapid propulsion of the chloroformed blood to the medulla oblongata, and consequently to a more rapid paralysis of the respiratory and vaso-motor centres and precipitous fall in the blood-pressure, such a condition being produced in some cases by ether, or division of both vagi, or by a full dose of atropine.

A similar state of affairs, they claim, follows slowing of the heart from pneumogastric inhibition, a theory which has frequently been accepted as explaining the danger of chloroform anæsthesia. This they claim to act in the same way, and that the controlling influences of the pneumogastric nerve upon the heart is a safeguard against the absorption of an overdose of chloroform, and that it is the *exhaustion* of the nerve which is dangerous. Further, they maintain that complete stoppage of the respiration always means that an overdose has been administered, and carefully watching the respiration and stopping the administration of the anæsthetic the minute that any disturbance appears should prevent any accident. Again, another conclusion which revolutionizes apparently the teaching of previous experience is that chloroform has no power of increasing the tendency to either shock or syncope during operations. If shock or syncope from any

cause does occur, the commission claim that it prevents, rather than aggravates, the dangers of chloroform inhalation; so also a hemorrhage, which may be dangerous in itself from reduction of blood-pressure, they claim in no way affects the action of chloroform, except in so far that a patient who has been nearly bled to death will require less chloroform in his system to put him in a state of anæsthesia.

These are the more important points brought out in the examination of their report. We can have no hesitation in admitting that their results seem to be absolutely conclusive as far as they go, although we would most decidedly qualify their sweeping conclusions as to the absolute safety of chloroform, as first claimed by the *Lancet*, as perhaps tending "to inculcate a disregard of the heart as a factor in chloroform dangers, and so do harm and provoke a slipshod carelessness in the use of that valuable anæsthetic." Assuming that their conclusions are absolutely correct, all that they prove is that in the pariah dogs of India chloroform arrests respiration before it stops the heart. We cannot acknowledge, however, that this negative result in the heart can vitiate the observation so often made by ourselves and many others that in large doses chloroform may arrest the heart before the breathing stops or may stop both simultaneously. We thus maintain that the statement that "however concentrated the chloroform may be, it never causes sudden death from stoppage of the heart" is absolutely unwarranted.*

Further, even their experiments show that a second's carelessness or overprolongation of the administration of the anæsthetic, though it be but for an instant, may end fatally. This fact certainly does not warrant the statement that "If the above rules be followed, chloroform may be given in any case requiring an operation with perfect ease and absolute safety, so as to do good without the risk of evil."

Thus the question still remains whether an anæsthetic which does not demand so many precautions, whose neglect may prove suddenly fatal, is not the safest after all. The commission prove that in their experiments chloroform first arrested the respiration before acting on the heart; and even though this were universally true, it would only reduce the dangers attending its use, not remove them.

We can scarcely believe that death from the use of chloroform has become avoidable, or that future deaths from this anæsthetic would indicate carelessness on the part of the administrator, and *that* must be the inevitable conclusion if the sweeping conclusions of the commission are accepted. We should think that their labors, together with the record of *accidental* deaths which occurred during their own experiments, would go far to make a surgeon hesitate to use an agent which undeniably may prove fatal, and which, if the commission is regarded as authority, would, in the event of a fatal issue, make him liable to the charge of criminal carelessness.

In conclusion, we would call attention to a paper by Ostertag, of which we publish an abstract on another page, which opens an entirely new line of investigation as to the action of chloroform.

* Since the above was in type Drs. H. C. Wood and H. A. Hare have published in the *Medical News*, February 22, 1890, a number of experiments which offer the *positive* proof, in opposition to the *negative* statements of the commission, that chloroform may arrest the heart before arrest of respiration. In one experiment breathing continued two minutes after the heart had ceased to act.

THE ACTION OF CATHARTICS.

THE action of cathartics is in general attributed to the increased peristalsis produced through irritation of the intestinal mucous membrane. In the case of saline cathartics, on account of the slight local irritation which they may be supposed to produce, some additional factor in the production of catharsis is necessary, and we find this factor either in the increase of intestinal secretion produced by these agents, or in the transudation of water from the blood into the intestinal canal from the osmotic phenomena concerned in their absorption. According to this view, we would naturally expect that the salts, with the higher osmotic equivalents, are those which are the most active cathartics. By the term osmotic equivalent is meant the number of parts, by weight of water, which pass through a membrane to replace each part of the salt which passes in the opposite direction. Thus, if a saturated solution of magnesium sulphate be separated by a membrane from distilled water, for every part of the Epsom salt which passes through the membrane to the water, 11.7 parts of water will pass through the membrane to the salt. It is quite conceivable that a somewhat similar state of affairs obtains in the alimentary tube. The passage of a salt through the in-

testinal walls to the blood entails a loss of water to the blood which must pass into the alimentary tube, and we would naturally expect that the substances which cause the greatest transudation of fluid would be the most active cathartics. Thus we find that the osmotic equivalents of Epsom salt and Glauber salt are much higher than those of sodium phosphate, sodium chloride, or sodium and potassium tartrate, and the former are much the most active cathartics.

The share attributable to the increase of peristalsis as a factor in the production of catharsis, after the administration of laxatives, has been carefully studied out by Drs. J. Brandl and H. Tappeiner, who publish an elaborate experimental essay, based upon an ingenious method of experimentation, in the *Archiv für Experimentelle Pathologie und Pharmakologie*, Band 26, Heft 3 and 4, 1889.

The method which they employed consisted in making a gastric fistula in a dog near the pyloric orifice, and then inserting into the intestinal tube, through this fistula, a rubber bulb attached to a long graduated rubber tube. Through the intestinal peristalsis the rubber bulb is gradually forced farther and farther down through the intestine, and the intensity of peristalsis may be estimated either by measuring the length of tube drawn into the intestine in any given time, or by attaching the free end of the tube over a pulley to a weight, and then measuring the force exerted by the peristalsis directly by estimating the weight which it is capable of overcoming. As it may be readily imagined that in different individuals, even under the same circumstances, the energy of peristalsis would differ, the authors performed their series of experiments upon a single dog, allowing a period of at least a week to elapse between the different experiments, so as to avoid any danger of the production of chronic intestinal catarrh from too frequent repetition; and they state that in no case was a second experiment commenced until the evacuation of the intestinal contents had been perfectly normally performed for several days before the second experiment. In a number of instances a number of weeks were allowed to elapse between the successive experiments, and the authors' series of experiments were thus extended over nearly two years. In all cases no substance was tested until the movement of the bulb had become tolerably regular, by which time it was usually found that the bulb occupied a position of a little more than three feet below the fistula. The apparatus was so constructed that the injection could be made directly at the point at which the bulb was at that moment located, and on either side of the bulb at will,—that is, immediately below the obstructing bulb, or on the upper side, towards the pylorus. The bulb, when distended with water, possessed a diameter of about three centimetres; the volume of the fluids injected into the intestine amounted, as a rule, to about one hundred and fifty centimetres, which was followed ordinarily by an injection of about fifty centimetres of water, so that two hundred centimetres in all were injected into the intestine. The solutions ordinarily contained 1 decigramme (1⅞ grains) of potassium ferrocyanide, so that on the exit of fluid from the fistula, or in the production of diarrhœa, the addition of ferric chloride would permit of the detection of the presence or absence of the injected fluids.

The first series of experiments was directed towards the determination of the actual length of the intestinal tube. It was found that, after filling the rubber bulb with fifteen cubic centimetres of water, it steadily descended through the intestinal tube for eight or nine hours, and then was arrested. The length of rubber tube which in this time was drawn down through the intestine averaged two hundred centimetres, only in a few cases deviating from this number by ten to forty centimetres, the bulb then lying directly above the sphincter ani. When no cathartics were administered, the bulb was never spontaneously evacuated through the rectum, but was only removed through the injection of a soapy enema. The length of the entire intestinal tube thus measured amounted then to about two hundred and five centimetres.

The first series of experiments as to the influence of injections were made after the administration of from 150 to 350 cubic centimetres of dilute (one per cent.) salt solutions. These were found to exert no marked influence, although concentrated solutions of common salt (fifteen per cent.) were found to slow considerably the progress of the bulb. The experiment was then made with the different cathartics, first injecting them *below* the bulb, the result of this series of experiments proving that the drugs so administered almost invariably were without influence on the rapidity of the movement of the bulb; in but rare instances was the movement increased.

The experiments made with the cathartics *above* the bulb offer some very interesting results. In the following tables each number represents the length of tube in centimetres

drawn in that time into the intestine, the number in brackets representing the total length of tube at the end of the corresponding half-hour which had been drawn into the intestine. The asterisk denotes the time of injection of the cathartic, all subsequent numbers denoting the progress of the bulb after the administration of the drug.

The influence of the injections of sodium sulphate on the movement of the bulb is inexplicable. In certain instances, examination of the table will show that the maximum of the normal progress of the bulb in half an hour is fourfold accelerated, and then practically arrested, or there is a steady, more moderate increase in the rapidity of movement.

In the experiments made with the infusion of senna, it was noticed that the bulb was in nearly every case extruded from the anus, and that the rapidity of movement at the end of the experiment was nearly always more rapid than immediately after the injection, an observation which seems to show that senna acts especially on the large intestines. Further, it is stated that diarrhœa was ordinarily not produced until after the bulb was removed from the intestine. The experiments made to determine the power exerted by the bulb in its descent through the intestine further show that the cathartics increase the energy with which the bulb moved; or, in other words, the actual power of peristalsis was increased, as was indicated by the fact that the descending bulb was able to lift a greater weight after the administration of cathartics than was the case before, this being especially marked when the bulb was located low down in the intestine.

FIRST SERIES.—*Injections of Sodium Sulphate Solutions above the Bulb.*

Experiment 1. 30 : 200 water.	Experiment 2. 30 : 200 water.	Experiment 3. 30 : 200 water.	Experiment 4. 30 : 200 water.	Experiment 5. 30 : 200 water.	Experiment 6. 30 : 300 water.	Experiment 7. 30 : 600 water.
14 (31)	52 (72)	40 (57)	11 (34)	48 (68)	5 (35)	8 (43)
20	9	13	28	7	7	6
9	6	13	8	12	7	11
6	5	6	13	1	11	10
9	5	4	9	0	15	11
3	10	3	11	0	9	11
5	3 (110)	0	8	0	4	3
4	53*	7	4	12	7	5
3	0	7 (110)	0 (120)	3	10	8
6 (103)	0	30*	10*	14	4	5
10*	0	29	12	10	4	6
34	0	26	33	8	7	4 (123)
9	5	2	0	7 (145)	4	7
24	0 (170)	3	22	13*	3 (127)	63*
18 (198)	...	0	7	52	23*	10
0	...	4 (204)	0 (204)	37 (247)	25	17
...	...	...	...	...	25	0 (220)
...	...	...	...	...	20 (220)	...

SECOND SERIES.

Infusion of senna. 40 : 200 water.		Convolvulin. .5 : 200 water with .1 bile.		Castor oil. 50	95	Croton oil. .2	Colocynthin. .05 : 200 water.	Crystalline aloin. 1 : 200 water.
37 (67)*	15 (35)	45 (65)	15 (45)	13 (33)	20 (40)	13 (48)	11 (38)	15 (35)
4	15	19	5	17	15	5	10	17
6	23	0	12	23	14	11	13	12
3	7	4	19	14	16	8	10	0
2	5	3	9	0	0	10	11	4
2	0	4	0	7	10	8	8	6
1	5	7 (112)	7	4	0	5	11	0
9	10	3	11 (108)	12	0	5	11	5
3	2	26*	0*	0	8	0	0 (112)	4
8	8	19	8	5	7	0	6*	14
5* (110)	5	9	4	4	5 (115)	8	7	10
10	5	6	28	1 (120)	25*	7 (115)	35	7 (115)
0	2	7	24	10*	15	20*	6	15*
15	7 (122)	8	9	30	14	20	2	10
14	31*	15	19	0	21	13	0	0
8	17 (170)	15	10 (210)	15	0 (180)	0	0	0
18	...	5 (225)	...	5 (180)	...	14	2	10
24 (199)	...	...	...	...	...	0 (182)	0 (170)	5
...	...	...	...	...	...	...	15	...
...	...	...	...	...	...	...	0 (170)	...

THE COMPARATIVE ACTIVITY OF THE DIFFERENT DIGITALIN PREPARATIONS.

THERE seems to be very little prospect of a satisfactory conclusion of the controversy as to the activity of the different digitalis preparations. In fact, we can readily understand how a physician, reading the statements of different authors as to the activity of the different preparations of the active principle obtained from digitalis, might hesitate, in the face of such marked contradiction, to believe that any statement is worthy of reliance. The greatest confusion exists as to the different classes of digitalin. Thus there exist the crystalline digitalin of Nativelle; the amorphous digitalin of Homolle and Quevesne, which are officinal in France, the latter being designated as chloroformic digitalin; digitalin soluble in water; the German digitalin, which is soluble in water, and often described as amorphous digitalin; and, finally, the German digitaloxin, which seems to be identical with crystalline digitalin. The literature as to the action of these different preparations is a very extensive one, and it is very difficult at present to form any conclusion as to the value of these different substances. Our only hope is to continue to prosecute studies as to the action of these different preparations, with the hope that finally they may be sufficiently well classified to enable us to select the most active preparation. At present, as for some time has been the case, the tincture appears to be the only reliable preparation.

In a paper read by M. Bardet before a recent meeting of the Société de Thérapeutique (*Le Progrès Medical*, December 21, 1889), he reports the results of some experiments made with the crystalline digitalin, made according to Arnaud's formulæ, the amorphous digitalin of the Codex, the German digitalin, and digitaloxin and digitalein. His experiments were made on frogs and rabbits, employing the hypodermic method, with watery or alcoholic solutions, administering in each case toxic doses. Bardet has found that with the crystalline digitalin the fatal dose for frogs is about a $\frac{1}{40}$ grain, while for the rabbit it is $\frac{1}{20}$ to $\frac{1}{8}$ grain for every two pounds body-weight. The amorphous digitalin of the French Codex possesses about the same degree of activity as the crystalline digitalin, as is also the case with digitaloxin of German origin. Digitalin soluble in water, made by maceration of the leaves in water, produced death when administered in doses of from ¾ to 1 grain per every two pounds of body-weight in rabbits. Thus, it is fifteen or twenty times less poisonous than the amorphous chloroformic digitalin. As to the attributes of these different preparations, the crystalline and the amorphous digitalin, prepared according to the formulæ of the French Codex, are entirely soluble in chloroform; they possess an identical action, and are perfectly comparable in their effects (*La France Médicale*, December 7, 1889).

The German digitaloxin, on the other hand, is incompletely soluble in chloroform, and its activity is two or three times less than that of the French digitalin; on the other hand, the French digitalein and the German digitalin are both soluble in water and insoluble in chloroform, and are not to be regarded as definite products. Their action is from twenty to twenty-five times more feeble than that of the French digitaleine or the chloroformic digitalin; while it must not, however, be forgotten that the action on the heart may not be exactly the same as that of the digitalin of the Codex.

General testimony appears to favor the use of the crystalline digitalin, which is claimed by numerous observers, especially by Bardet (*Les Nouveaux Remèdes*, December 24, 1889), to be a remedy which is absolutely constant in its action and of perfectly definite composition.

Reports on Therapeutic Progress.

THE SECOND HYDERABAD CHLOROFORM COMMISSION.

The experiments of the committee were designed to show the effect upon the blood-pressure, heart, and respiration of the inhalation of chloroform, ether, and the A. C. E. mixture, administered in various ways and under varying conditions. The objects of the commission were five in number:

I. To test the suitability and safety of chloroform as an anæsthetic. The experiments with ether and the A. C. E. mixture were instituted principally for the sake of comparison with chloroform on certain points, and it is not pretended that they afford a complete exposition of the action of those agents on the system.

II. The effect of pushing the above-named anæsthetics (*a*) to a dangerous degree, and more especially until the respiration ceases; (*b*) until death results.

III. The modifications in the effects of

these anæsthetics which result from (*a*) asphyxia in varying degrees and produced by various means, (*b*) from the use of drugs such as morphine, atropine, physostigmine, and others.

IV. The reality or otherwise of the alleged liability during ordinary chloroform administration to the occurrence of primary or secondary syncope or stoppage of the heart, brought about either by shock or through fatty or weak heart, or by hemorrhage, or by changes in the position of the body. To investigate these points, in the first place a large number of operations which are reported to be especially dangerous in reference to shock were performed in every stage of anæsthesia, and numerous experiments were also made to show the effect of direct irritation of the vagus. Secondly, a number of animals were dosed with phosphorus before they were experimented on. This caused weakening of the heart by fatty degeneration of its fibres, but at the same time other complicated changes in the whole of the organs of the body not met with in the condition known as fatty heart in human beings. On the other hand, there are conditions often met with in the fatty heart, such as changes of the coronary vessels, which were not produced by the phosphorus.

V. The effect of the anæsthetics above mentioned upon different animals, more especially upon monkeys, as the nearest approach to human beings.

The conclusions to which the commission has been brought by the study of these experiments are the following (*Lancet*, January 18, 1890):

1. Chloroform, when given continuously by any means which insures its free dilution with air, causes a *gradual* fall in the mean blood-pressure,* provided the animal's respiration is not impeded in any way, and it continues to breathe quietly without struggling or involuntary holding of the breath,—as almost always happens when the chloroform is sufficiently diluted. As this fall continues, the animal first becomes insensible, then the respiration gradually ceases, and lastly the heart stops beating. If the chloroform is less diluted, the fall is more rapid, but is always gradual, so long as the other conditions are maintained; and however concentrated the chloroform may be, it never causes sudden death from stoppage of the heart. The greater the degree of dilution the less rapid is the fall, until a degree of dilution is reached which no longer appreciably lowers the blood-pressure or produces anæsthesia.

2. If the inhalation is interrupted at any stage, the fall of pressure still continues at a rate which depends altogether on the rapidity of the fall while the chloroform was being inhaled. This after-fall is probably due to absorption of a portion of the residue of chloroform in the air-passages after the stoppage of the inhalation. In this way it often happens, if chloroform is given rather freely, that, though the respiration may be going on when the chloroform is discontinued, it afterwards stops.

3. If the administration of the chloroform is stopped at an early stage, the pressure very soon begins to rise again, and gradually becomes normal; but if the chloroform is pushed further, there comes a time, not easy to define, when the blood-pressure and respiration will no longer be restored spontaneously, although the heart continues to beat after the inhalation is stopped.

4. If the fall has been very gradual, it may occasionally happen that the respiration stops completely, and still the blood-pressure rises again, the respiration recommencing spontaneously in the course of the rise. In the same way, when the inhalation has been discontinued, the respiration may stop during the after-fall of the blood-pressure and begin again spontaneously. As a rule, if the respiration has stopped, or even becomes slow and feeble at the time when the inhalation is discontinued, and artificial respiration is not resorted to, the fall in blood-pressure will continue until death ensues.

5. There are two conditions which frequently disturb the gradual fall of the blood-pressure,—viz., struggling and holding the breath,—and it is only by great care that they can be avoided in animals.

6. Struggling, independently of any change in the respiratory rhythm, appears generally to raise the blood-pressure. In one case of a dog much weakened from phosphorus, the pressure fell every time he struggled.

7. When struggling is accompanied, as it often is, by acceleration of the respiration and pulse, especially if the respiration is deep and gasping, it leads to a more rapid inhalation of chloroform, and consequently to a more rapid fall of blood-pressure and a greater after-fall. In order to keep the chloroform-cap or inhaler in its place during

* Every tracing was photographically reproduced, and a copy of the complete work will be presented to all of the principal medical libraries throughout the world.

the animal's struggles, the administrator is obliged to hold it down more tightly over the nose and mouth, and this materially assists in hastening the rapidity of the inhalation, and consequently of the fall in blood-pressure.

8. The effect of involuntarily holding the breath—which, as anybody can prove by experiment upon himself, must happen when an inhaler saturated with chloroform is first applied to the face—is much more remarkable, the pressure often falling with great suddenness, while the heart's action is markedly slowed. As soon as the animal draws breath again, the pressure rises as suddenly as it fell, but the gasping respiration which succeeds then causes very rapid inhalation of chloroform, with immediate insensibility and a rapid fall of blood-pressure, which quickly becomes dangerous.

9. The combination of struggling with alternate holding the breath and gasping, which results if chloroform is applied closely to the face without sufficient dilution with air, causes violent fluctuations, and then a speedy fall of the blood-pressure, which very soon leads to a dangerous depression with deep insensibility and early stoppage of the respiration. The after-fall under these circumstances is rapid and prolonged. It is this combination of events which causes struggling animals to go under chloroform so quickly.

10. The effect of holding the breath may occasionally cause a temporary fall of blood-pressure after the chloroform inhalation has been stopped, or even when the animal is quite out of chloroform. This fall is recovered from directly the animal breathes again.

11. Slight continuous asphyxia, such as is produced by pressure on the neck by straps, a badly-fitting muzzle, or hinderance of the chest movements by the legs being too tightly bound down, gives rise to exaggerated and irregular oscillations of the blood-pressure, and slowing and irregularity of the heart's action. If it leads to, or is accompanied by deep gasping inspiration, it is apt, like anything else which causes this, to increase the intake of chloroform and bring about a rapid decline of blood-pressure.

12. Complete or almost complete asphyxia, as by forcibly closing the nose and mouth, or closing the tracheal tube after tracheotomy, has an effect similar to, but more marked than, that produced by holding the breath, and the character of the trace corresponds precisely to that produced by irritation of the peripheral end of the cut vagus. The pressure falls extremely rapidly, sometimes almost to zero, and the heart's action becomes excessively slow, or even stops for a few seconds. If the Fick trace of Experiment 148 be compared with the photographic reproduction of Trace A of the Glasgow committee, it will be seen that they are identical, and that the slow action of the heart with great fall of pressure, which the Glasgow committee attributed to some capricious action of chloroform upon the heart, was undoubtedly due to asphyxia.

13. This effect of asphyxia is the result of stimulation of the vagi. The proof of this is (*a*) that the trace corresponds exactly, as stated above, to that produced by direct irritation of the vagus, (*b*) division of both vagi entirely abolishes it, and (*c*) the administration of atropine which paralyzes the vagus also abolishes it.

14. In Trace 158 (Fick 4), which was taken during asphyxia after a full dose of atropine, it will be seen that there is an alternately slow and rapid pulse, according to the phase of the respiratory movement, but no continued slowing of the heart as in vagus irritation. But there was still a distinct fall of pressure after the atropine when the breath was held, and it was thought that the slowing of the pulse above noted in this condition might be due to the disturbance of the heart from tension in the pulmonary vessels in the absence of respiratory movement, rather than to irritation of the vagi. To test this point Experiment 184 was instituted. In this experiment the dog's chest was forcibly inflated with bellows connected by a tube with the trachea, and the effect of this proceeding was to cause a fall of pressure and slowing of the heart exactly the same as involuntary holding of the breath. The dog was then poisoned with atropine, after which inflation of the chest still caused a fall of pressure, but without slowing of the heart. The fall of pressure must be in some degree independent of vagus irritation, which, however, usually accompanies it.

15. It only remains to be considered whether the slow action or temporary stoppage of the heart with great fall of pressure produced by vagus irritation is in itself an element of danger in chloroform administration, and if it is not, wherein the danger actually lies.

16. The experiments in which deliberate irritation of the vagi was carried on during anæsthesia show unmistakably that irritation

of these nerves diminishes rather than enhances the danger of anæsthetics. The effect upon the heart is never continuous, and as the vagus becomes exhausted, or when the irritation is taken off, the blood-pressure rises again, as it does when the same result is produced by asphyxia. The slowing of the heart and circulation which is produced by irritation of the vagus by any cause, such as holding the breath in chloroform administration, retards the absorption and conveyance of chloroform to the nerve-centres, just as holding the breath, whether voluntary or involuntary, prevents chloroform from entering the lungs; and of itself slowing or temporary stoppage of the heart in chloroform administration is not dangerous.

17. To answer the second part of the last question in Paragraph 15 is easy enough, if it is kept in mind that the effect of vagus irritation upon the heart is never continuous; and in chloroform administration, as the pressure rises again after the slowing of the heart and temporary fall of pressure produced by any form of asphyxia, violent respiratory efforts with bounding heart's action lead, as in the case of struggling, to a rapid and dangerous inhalation of chloroform, and consequent rapid and dangerous decline in blood-pressure. It is, in fact, the temporary exhaustion of the vagi after stimulation that is to be feared, and not the actual stimulation as long as it is continued.

18. In accordance with this fact, it will be found that in chloroform administration neither holding the breath, even if involuntary, or vagus inhibition can be kept up beyond a certain time; and if the chloroform is not removed from the face, one or both of two things may happen: (*a*) when the animal breathes again, it takes deep and gasping inspirations, the lungs become filled with chloroform, and an overdose is taken in with extreme rapidity; or (*b*), when the restraining influence of the vagus is taken off the heart, through the irritation ceasing or the nerve becoming exhausted, the heart bounds on again, and the circulation is accelerated in proportion. The blood then becomes quickly saturated with chloroform, and an overdose is at once conveyed to the nerve-centres. The theory which has hitherto been accepted is that the danger in chloroform administration consists in the slowing or stoppage of the heart by vagus inhibition. This is now shown to be absolutely incorrect. There is no doubt whatever that the controlling influence of the vagus on the heart is a safeguard, and that it is the exhaustion of the nerve which is dangerous.

19. It can be readily understood how a condition in which the pulse is rapid and bounding, with high blood-pressure, leads to more rapid absorption of chloroform from the lungs, and a more rapid propulsion of the chloroformed blood to the medulla oblongata, and consequently to a more rapid paralysis of the respiratory and vaso-motor centres and precipitous fall in the blood-pressure. Such a condition is produced in some cases by ether or by division of both vagi, or by a full dose of atropine. Not only is the poisoned blood carried more swiftly to the vital centres in these cases, but added to this there is the fact that, as the heart is already doing its utmost before the chloroform is given, it is unable to stave off by increased work the fall in pressure that occurs when the vaso-motor centre is paralyzed. On the other hand, it seems clear from Experiment 92 that the direct action of chloroform upon the heart's substance is not the cause of the fall of pressure that occurs when it is inhaled.

20. In Experiment 92 repeated injections of 20 minims of chloroform were made into the jugular vein, and its effect was not to paralyze the heart, but to produce anæsthesia and a gradual fall of blood-pressure exactly as if the chloroform had been inhaled. In Experiment 72, after a considerable amount of ether had been injected into the jugular vein, and a bounding condition of pulse had been produced, the effect of injecting chloroform into the jugulars was much greater, and the fall of blood-pressure much more rapid and dangerous, than in the case when chloroform alone was injected. Granting, then, the truth of Ringer's conclusions from experiments on the frog's heart (which have not been repeated and confirmed by the commission) that chloroform has a gradual paralyzing effect upon the heart's tissue, we must conclude that such an effect, in the degree in which alone it could occur in the practical inhalation of chloroform, would rather be a source of safety than of danger.

21. The committee discussed the advisability of cutting the vagi some time previously to experimenting on the blood-pressure with chloroform. The effect of this procedure is to cause continuous rapid action and tendency to exhaustion of the heart, as well as to degeneration of the terminal branches of the nerves in the heart if the animal live sufficiently long. Such experi-

ments might be of some interest theoretically, and also have had a practical bearing upon the condition of the heart in certain cases of chronic alcoholism; but the committee decided not to perform them, as it considered the end to be gained did not justify the pain they would have inflicted.

22. In Experiment 178, the case of a dog that had had morphine, remarkable slowing and even temporary cessation of the heart's action occurred again and again at the same moment as the respiration stopped, but the heart invariably recovered itself, and began again to beat regularly before any steps were taken to restore the animal, and without any respiration occurring. We find in this case that it was possible to restore the animal even after unusually long intervals had been allowed to elapse between the cessation of the natural and the commencement of artificial respiration. The failure of the heart, if such it can be called, instead of being a danger to the animal, proved to be a positive safeguard, by preventing the absorption of the residual chloroform and its distribution through the system.

23. The effect of artificial respiration after the natural respiration has ceased is to cause an alternate rise and fall of small amount in the blood-pressure, the trace thus formed upon the drum being a coarse imitation—altered somewhat by the shaking of the table—of the natural respiratory curve. The difference consists chiefly in the fact that the artificial rise and fall are more abrupt than in natural breathing, and that the rise always coincides with expiration or compression of the chest. After artificial respiration has been continued for a certain time, the blood-pressure begins to rise again, and a little later natural respiration returns.

24. The effect of artificial respiration in restoring an animal after the respiration had stopped was always marked. In a few exceptional cases, such as Experiment 159, a phosphorous dog, and Experiment 142, a horse which had an enormous overdose, although the artificial respiration was commenced as soon as possible after the breathing was noticed to have stopped, it was not successful.

25. Complete stoppage of the respiration always means that an overdose has been administered, and the overdose may have been so great as to produce a very prolonged after-fall of blood-pressure, and may thus render restoration impossible. As it is impossible to say whether, after chloroform has been pushed and then discontinued, the respiration will be restored spontaneously or not, so it is never in any case certain that artificial respiration will restore the natural respiration and blood-pressure, no matter how soon it is commenced after the respiration stops. A great deal depends upon the amount of the after-fall; in some cases, even after the respiration has been restored, the pressure continues to fall and respiration again ceases, and artificial respiration then fails. We thus find respiration restored by artificial respiration, while chloroform is still being absorbed, and this tends to show that artificial respiration does not merely pump the chloroform out of the blood, but exerts considerable influence in exciting the natural respiration.

26. The time which elapses before artificial respiration succeeds in restoring natural respiration varies very greatly. In one case, Experiment 116, it was continued for eleven minutes before the first natural gasps commenced. This period is undoubtedly prolonged in some cases by a condition of physiological apnœa, which renders it unnecessary for the animal to breathe. Consequently, whenever the pressure rose considerably during artificial respiration it was stopped, and the animal then generally breathed after a few seconds.

27. The time which may be allowed to pass with impunity before commencing artificial respiration also seems to vary considerably. This point was not particularly attended to in the manometer experiments, except in Experiments 162 and 178, which were instituted to test the truth of the opinion formed by the sub committee that morphine had some slight action in impairing the efficiency of artificial respiration. In these cases the commencement of artificial respiration was postponed for more than two minutes after respiration ceased, and was successful; but this is certainly far above the average interval that can be allowed with safety. The success of artificial respiration in restoring the blood-pressure is in some cases very remarkable; *vide* especially Experiment 40, in which the heart had apparently ceased beating, and the dog was believed by every one present to be dead, and yet recovered with artificial respiration. The success in this instance is due to the fact that chloroform had only been administered for a few seconds, and that the depression was the result, not of continuous chloroform administration until respiration ceased, but of a long and severe after-fall.

28. It corresponds to those cases, which are so often reported, in which dangerous failure of the heart is said to have occurred some minutes after the administration of chloroform had been discontinued, and which are sometimes restored, and sometimes not, by artificial respiration. There is nothing at all sudden about the failure of the heart in these cases, but the attention of the chloroformist, which has been wandering, is suddenly called to the fact that the patient is apparently dead. When the animal was really dead, it was found in some cases that artificial respiration still maintained a small amount of mean pressure in the manometer. In others the pressure seemed to fall to the zero line between each compression of the chest.

29. The dangers of too vigorous artificial respiration were illustrated in some of the accidental deaths. In one case the liver was badly ruptured, and in another the pleural cavity was full of blood. In three cases—Experiments 80, 92, and 103—rhythmical movements of the diaphragm were noticed after the heart had ceased beating and after the chest had been opened. It is remarkable that in two of these cases the splanchnic nerve had been divided. The third was a case in which chloroform had been injected into the jugular vein, and in this case there was a synchronous movement of the jaw as well. In all, death and stoppage of the heart had occurred gradually, and in Experiment 103 the heart was still irritable. These movements cannot be called respiration; though the last gasp of a dying animal, that ineffective jerk of the diaphragm, which is such a fatal symptom, is very likely in many cases a movement of the same character. Similar movements, which were continued much longer, occurred in Experiment 104, after the thorax was opened, while the heart was still beating. Still more remarkable convulsions of the muscles of the jaws, ears, and forefeet occurred in Experiment 167, in the case of a dog that had been poisoned with nicotine. These movements continued at regular intervals for more than ten minutes after death, and were sufficiently forcible to jerk the handles of a pressure forceps fixed on the end of the tongue off the table at each spasm. In a rabbit, in Experiment 153, the auricles of the heart continued to beat rhythmically for three hours after it was supposed to be dead from chloroform and its thorax had been laid open. Irritability of the heart after death was noticed in many cases, but seemed to be most marked in cases where ether had been used.

30. Chloroform injected into the heart through the jugular vein did not cause clotting of the blood, as was the case when ether was injected.

31. In the course of the experiments of the committee various drugs were administered in order to ascertain if they had any effect in modifying the action of chloroform. The result showed that none of them had any effect in preventing the typical descent of the blood-pressure that occurs when chloroform is inhaled. Atropine, when given in a dose sufficient to paralyze the vagi, of course prevents the action of those nerves in asphyxia, and by increasing the action of the heart it appears to cause a more rapid descent in the blood-pressure when chloroform is inhaled, as has been already explained. Morphine appeared in Experiment 162 to render the rise in blood-pressure that occurred when the chloroform was discontinued slower and less complete, and to bring about a more or less permanent condition of anæsthesia. It may be noted that the animal used in this experiment was a monkey; and in other experiments with monkeys, when no morphine had been given, it was remarked that the animal, after a few inhalations of chloroform, would often lie quite quiet in a state of semi-insensibility for a long time without further inhalations; still this condition was much more marked in Experiment 162 than in any of the others. No action of this kind was noticed in the dog in Experiment 178, but other experiments (90 and 94) showed that pariah dogs are very indifferent to the action of morphine, and it is probable that the dose of morphine in this case was insufficient to bring about the condition noted in the monkey. The peculiar behavior of the heart in Experiment 178 was not the result of the previous administration of morphine, for a similar phenomenon had occurred in other cases (49 and 60) in which no morphine had been given. Experiment 162 and 178 prove conclusively that morphine has no effect in shortening the period that may be allowed to elapse between the cessation of natural respiration and the commencement of artificial respiration.

32. The other drugs used had no effect upon the action of chloroform, except when their own special action became the leading feature in the case,—as, for instance, during the vomiting from apomorphine (Experiment 104, Fick 9) or the convulsions produced by nicotine (Experiment 167).

33. In order to test the alleged danger from shock during chloroform administration, the committee performed a very large number of those operations which are reputed to be particularly dangerous in this connection,—such as extractions of teeth, evulsion of nails, section of the muscles of the eye, snipping of the skin of the anus, etc. In many cases the operation was performed when the animal was merely stupefied by the chloroform and not fully insensible. In such cases a slight variation in the blood-pressure would sometimes occur, such as one would expect from the irritation of a sensory nerve or from the struggling that ensued, but in no case in any stage of anæsthesia was there anything even suggestive of syncope or failure of the heart's action. In thrusting a needle into the heart, there was often a momentary but well-marked fall of blood-pressure; but even this was absent in all other injuries. If chloroform really had any power to increase the tendency to shock in operations, it is impossible to believe that it would not have been manifested, to some degree at least, in one or other of these numerous experiments. The commission was, however, not content with this negative result, and determined to ascertain the effect of direct irritation of the vagi during continued chloroform administration. The result of such experiments (65, 117, and others) proved that inhibition of the heart's action prevented, rather than assisted, the fatal effects of prolonged chloroform inhalation. An animal that was put into a condition of extreme danger (from which it could only be restored by means of artificial respiration) by inhalation of chloroform for one minute, recovered spontaneously and readily after five minutes of chloroform inhalation, together with inhibition of the heart by electrical irritation of the vagus carried on simultaneously. In one of these experiments (117) chloroform was pushed for seven minutes; and during continued irritation of the vagus the animals repeatedly came round without artificial respiration. The danger really begins when the irritation is discontinued or fails to inhibit the heart, and thus enables the chloroform in the lungs to be rapidly absorbed and thrown into the system. The danger is certainly increased by deliberately pumping the chloroform into the lungs by means of artificial respiration, for animals in which this was done, although they showed a tendency to recover when the chloroform and irritation of the vagus were discontinued, afterwards died rapidly.

34. On another occasion, during Experiment 117, the animal was very nearly killed by a comparatively short inhalation of chloroform, owing to the electrodes becoming accidentally short circuited and failing to keep up the irritation of the vagus. Something similar occurred in Experiment 177, the effect of the irritation of the vagus passing off while the chloroform was still being pushed, and thus putting the animal into a condition of extreme and unexpected jeopardy. Nothing could be more striking than these near approaches to accidental death from failure to irritate the vagus efficiently.

35. Other experiments were made to test the truth of the statement that chloroform increases the action of electrical stimuli applied to the vagus, and showed conclusively that it has no such effect. In one instance only the inhibition seemed to be intensified as the chloroform was commenced, and diminished when it was discontinued; but apart from the fact that the supposed effect ceased much too suddenly, a repetition of the experiment on the same and other animals showed that there was in reality no such effect. The increased inhibition in this instance was due to the chloroformist compelling the attendant who was holding the electrodes to change his position, and thus making him unconsciously apply them more efficiently. When the chloroformist withdrew they were restored to their former position. This affords an instance of the care that has to be taken in making experiments if one is not to be deceived.

36. To test the effect of shock due to vasomotor change rather than affection of the heart, Goltz's experiment on the frog was repeated on three dogs. In one there was slight lowering of pressure, which was not extensive, and in the others no effect was produced at all. Other operations which seemed likely to produce shock, such as violent blows upon the testicle, were singularly devoid of effect. Failing to lower the blood-pressure by any of these methods, recourse was had to section of the splanchnics; but the low condition of blood-pressure this produced appeared, like stoppage of the heart from vagus irritation, to be a source of safety rather than of danger during chloroform administration. In this connection Experiment 111 may be studied. There was not much external hemorrhage, but the splanchnics were divided,—a proceeding which, as is often said, bleeds the animal into his own vessels. The pressure was after this extremely low, but chloroform was repeatedly

given and various other actions taken, and then chloroform had to be pushed on a saturated sponge enclosed in a cap for eleven minutes before respiration ceased.

37. The conclusion, then, is this: Chloroform has no power of increasing the tendency to either shock or syncope during operations. If shock or syncope from any cause does occur, it prevents, rather than aggravates, the dangers of chloroform inhalation.

38. The experiments on dogs that had been dosed with phosphorus for a few days previously show that the fatty and consequently feeble condition of the heart and other organs so produced has no effect in modifying the action of chloroform. The ease with which vagus irritation and the Glasgow trace could be produced in these animals, by even slight degrees of asphyxia, was very remarkable; but this was equally the case in dogs that had been given phosphorus only a few hours before the experiment, and whose organs were not yet fatty. Many of these cases were in the last stage of phosphorus-poisoning, and several of their companions died without any experiment having been performed on them before or on the same day as they died (*vide* the low state of blood-pressure in Experiment 163). Numerous attempts were made in these animals to produce shock by operations in the recumbent and vertical positions, but without any more result than in those that were healthy.

39. The truth about the fatty heart appears to be that chloroform *per se* in no way endangers such a heart, but on the contrary, by lowering the blood-pressure, lessens the work that the heart has to perform, which is a positive advantage. But the mere inhalation of chloroform is only a part of the process of the administration in practice. A patient with an extremely fatty heart may die from the mere exertion of getting upon the operating-table, just as he may die in mounting the steps in front of his own hall-door, or from fright at the mere idea of having chloroform or of undergoing an operation, or during his involuntary struggles. Such patients must inevitably die occasionally during chloroform administration, and would do so even were attar of roses or any other harmless vapor substituted for chloroform.

40. The effect of hemorrhage was tested by opening the femoral artery and allowing a considerable quantity of blood (eight to twelve ounces) to escape. An immediate lowering of the blood-pressure results, and this is very slowly recovered from. Such an accident, however dangerous it may be in itself, in no way affects the action of chloroform, except in so far that a patient who has been nearly bled to death would require less chloroform in his system to put him into a state of anæsthesia. The low condition of his blood-pressure produced by the hemorrhage would tend to prevent the too rapid intake of chloroform, exactly as in the case of cutting the splanchnics. (*Vide supra* subparagraph 36.)

41. When the hind feet are lowered on to the floor, so as to place the animal in the vertical position, a considerable fall of blood-pressure in the carotid artery occurs; but when the animal is replaced on the table in the recumbent position the pressure is fully restored. Various operations were performed on animals in the vertical position, but in no case was anything resembling dangerous shock produced. Inversion of the body, so that the animal stands on its head, has exactly the opposite effect, the pressure rising in the carotid artery, and again falling to its former state when the animal is replaced in the horizontal position. Inversion of the body failed to restore an animal that was in the last stage of chloroform-poisoning, though it raised the pressure in the usual way as long as it was continued. The change in the pressure of the blood of the carotid, which occurs when the position of the body is changed, appears therefore to be due simply to the effect of gravity.

42. As regards the effect of chloroform upon different animals, it may be said to be the same as far as its anæsthetic action is concerned. There are certain peculiarities in its effect on the respiration and circulation connected with its local irritant action on the nostrils and fauces which are interesting to notice. Thus, when concentrated chloroform vapor is applied to the nostrils of rabbits, they hold their breath, and the heart's action is slowed at once. This is always said to be due to reflex inhibition of the heart from irritation of the nasal branches of the trigeminus reflected through the vagus, and is by no means peculiar to chloroform, but is produced equally by any irritant vapor, such as ammonia or acetic acid.

43. In some dogs, and especially in those to which phosphorus had been given, stoppage of the respiration and slowing of the heart occurred immediately after the application of the chloroform to the face, or on forcibly pulling out the tongue, and this sug-

gests that the mechanism of cardiac arrest in them is precisely the same as it is in the rabbit. On the other hand, in rabbits, as in all other animals, it is possible to give chloroform so gently that no spasm of the chest occurs, no reflex effect is produced, and then the pressure falls in the same regular curve and with the same succession of phenomena (anæsthesia, cessation of the respiration, and lastly cessation of the heart-beat) that was above described as typical of chloroform inhalation.

44. Goats have a great tendency to hold their breath while inhaling chloroform, and monkeys resemble dogs rather than rabbits, as when ammonia was held before a monkey's nose (Experiment 98) it did not cause immediate stoppage of the respiration and heart as it does in rabbits.

45. The experiments with ether show that it is impossible to produce efficient anæsthesia with this agent unless some form of inhaler is used which thoroughly excludes the air. If an ordinary cap containing a sponge saturated with ether is applied very closely to the face, the animal generally holds its breath and struggles, and we at once get the fall of blood-pressure and slowing of the heart that invariably occur under these circumstances. If the ether is continued in this way after the animal has recommenced breathing, a condition of semi-anæsthesia results, in which the cornea is sometimes sensitive and sometimes insensitive, and the pressure rises and falls alternately to a slight amount and forms a wavy trace, which may be continued right round the drum without any particular change. As soon as air is rigidly excluded, the pressure commences to fall gradually, exactly in the same way as with chloroform, and with the same succession of phenomena,—viz., first anæsthesia, then cessation of the respiration, then of the heart movements, and finally death. How far this is due to ether and how far to the results of asphyxia it is impossible to say, but an exactly similar succession of events can be brought about by making the animal inhale carbonic acid gas alone.

46. If surgeons choose to be content with a condition of semi-anæsthesia, it can no doubt be produced with perfect safety, though with discomfort to the patient, by ether held rather closely over the mouth. Such a condition of imperfect anæsthesia would never be accepted by any surgeon accustomed to operate under chloroform. If more perfect anæsthesia is required, it can be procured by excluding the air more rigidly, but then there is exactly the same danger as in giving chloroform. How very suddenly and rapidly the pressure may fall and death ensue is well shown by Experiment 33. Ether injected into the jugular vein produces a fall of blood-pressure and anæsthesia in the same way as chloroform does, but in all cases in which it was so injected large clots were found in the heart immediately after death. It is interesting to note that Claude Bernard seems to have formed a very similar opinion with regard to ether, as the following quotations from his work, entitled "Leçons sur les Anesthésiques et sur l'Asphyxie," published in 1875, show. The first quotation (p. 50) is as follows: "Aussi, un certain nombre de chirurgiens proposèrent-ils d'abandonner le chloroforme pour revenir à l'éther, dont l'usage paraissait moins à craindre. Aujourd'hui encore les chirurgiens de Lyons emploient préférablement l'éther. On croyait le chloroforme plus dangereux que l'éther parce qu'il était plus actif; mais, en réalité, la fréquence relative des accidents par le chloroforme tenait peut-être tout simplement à ce que c'était cet agent anesthésique qu'on employait dans l'immense majorité des cas. Plusieurs discussions ont été provoquées par les partisans de l'éther, surtout par les représentants de l'école de Lyons, et il a été constaté que l'éther, lui aussi, avait produit un certain nombre d'accidents mortels. Les deux agents anesthésiques usités peuvent donc, l'un comme l'autre, entraîner quelques risques de mort, et la chirurgie humaine a conservé presque partout le chloroforme, dont l'action est plus rapide et plus complète." The second quotation, to be found on p. 101 of the same work, runs: "Quant à l'éther et au chloroforme, leur action est à peu près la même au point de vue physiologique, sauf une différence d'intensité en faveur du chloroforme, ce qui nous fera généralement employer ce dernier corps de préférence à l'éther."

47. The A. C. E. mixture given gently with plenty of air and the other conditions mentioned before under chloroform produces the typical chloroform trace. Given freely to a struggling animal, it can produce a very rapid and dangerous fall of blood-pressure. In Experiment 52, Fick 4 shows very perfectly the effect on the heart of holding the breath.

ACCIDENTAL DEATHS.

31. The notes of the cases of accidental deaths that occurred during our experiments

have been left among the other notes in the position in which each occurrence took place, and they can be readily found by a reference to the index. The fatal result was brought about either by neglecting to watch the condition of the respiration during or after the administration of chloroform, especially while the carotid artery was being exposed, or from a reckless administration of chloroform in the endeavor to check or prevent struggles. In all the cases of accidental death the usual chloroformist was absent, and no one was attending to the chloroform. The notes would have been more complete if some one could have watched the condition of the animal and noted the gradual but unheeded cessation of respiration without calling attention to it. As it is, one has to be content with the remark that the breathing was noticed to have stopped at some particular time, but there is nothing to throw any light upon the condition during the important period that immediately preceded this discovery. A similar hiatus appears in the account of accidental deaths in the human subject, and is unavoidable. These cases are probably identical with the instances referred to by Snow, "in which animals died in a sudden and what was thought unaccountable manner while chloroform was given to prevent the pain and struggles which would be occasioned by physiological experiments. The death was not really sudden, but only rapid, and the result of reckless administration of concentrated vapor in the first instance, and careless neglect of the condition of the respiration in the second. There is no evidence whatever that a single one of them was due to paralysis or sudden stoppage of the heart, as Snow assumes to have been the case.

32. It must be remembered, in studying the tracings, that, except when it is expressly stated to the contrary, chloroform was throughout administered very freely. The degree and rapidity of the fall of blood-pressure are in almost all cases much greater than should be the case in administering chloroform to human beings. To avoid complicating the notes, the inhaler was kept on much more persistently, with none of those little interruptions while the cornea is being examined, etc., which always occur in practice. The whole series, with few exceptions, may be characterized as examples of reckless administration of chloroform, and accidental deaths would have been much more numerous had it not been that, when once the animal was connected with the manometer, it was kept under the most careful observation. Experiment 79 affords a most interesting exception. The chloroformist, though present in body, was absent in mind, and failed to observe and report the cessation of the respiration. The chloroform was, in consequence, pushed much further than it should have been, and the animal died sooner than was intended.

33. These cases are of themselves quite sufficient to show that animals are just as liable to death from the careless administration of chloroform as human beings; and the accidental deaths which occurred during the experiments of the commission afford the best possible proof that the effects of chloroform are identical in the lower animals and in the human subject. The statement so frequently made, that dogs are more resistant to chloroform than human beings, is entirely incorrect.

PRACTICAL CONCLUSIONS.

34. The following are the practical conclusions which the commission think may fairly be deduced from the experiments recorded in this report:

I. The recumbent position on the back and absolute freedom of respiration are essential.

II. If during an operation the recumbent position on the back cannot, from any cause, be maintained during chloroform administration, the utmost attention to the respiration is necessary to prevent asphyxia or an overdose. If there is any doubt whatever about the state of respiration the patient should be at once restored to the recumbent position on the back.

III. To insure absolute freedom of respiration, tight clothing of every kind, either on the neck, chest, or abdomen, is to be strictly avoided; and no assistants or bystanders should be allowed to exert pressure on any part of the patient's thorax or abdomen, even though the patient be struggling violently. If struggling does occur, it is always possible to hold the patient down by pressure on the shoulders, pelvis, or legs without doing anything which can by any possibility interfere with the free movements of respiration.

IV. An apparatus is not essential, and ought not to be used, as, being made to fit the face, it must tend to produce a certain amount of asphyxia. Moreover, it is apt to take up part of the attention which is required elsewhere. In short, no matter how it is made, it introduces an element of danger into the administration. A convenient

form of inhaler is an open cone or cap with a little absorbent cotton inside at the apex.

V. At the commencement of inhalation care should be taken, by not holding the cap too close over the mouth and nose, to avoid exciting, struggling, or holding the breath. If struggling or holding the breath do occur, great care is necessary to avoid an overdose during the deep inspirations which follow. When quiet breathing is insured as the patient begins to go over, there is no reason why the inhaler should not be applied close to the face; and all that is then necessary is to watch the cornea and to see that the respiration is not interfered with.

VI. In children, crying insures free admission of chloroform into the lungs; but as struggling and holding the breath can hardly be avoided, and one or two whiffs of chloroform may be sufficient to produce complete insensibility, they should always be allowed to inhale a little fresh air during the first deep inspirations which follow. In any struggling persons, but especially in children, it is essential to remove the inhaler after the first or second deep inspiration, as enough chloroform may have been inhaled to produce deep anæsthesia, and this may only appear, or may deepen, after the chloroform is stopped (*vide supra* sub-paragraphs 2 and 9 of conclusions in paragraph 30). Struggling is best avoided in adults by making them blow out hard after each inspiration during the inhalation.

VII. The patient is, as a rule, anæsthetized and ready for the operation to be commenced when unconscious winking is no longer produced by touching the surface of the eye with the tip of the finger. The anæsthetic should never under any circumstances be pushed till the respiration stops; but when once the cornea is insensitive, the patient should be kept gently under by occasional inhalations, and not allowed to come out and renew the stage of struggling and resistance.

VIII. As a rule, no operation should be commenced until the patient is fully under the influence of the anæsthetic, so as to avoid all chance of death from surgical shock or fright.

IX. The administrator should be guided as to the effect entirely by the respiration. His only object, while producing anæsthesia, is to see that the respiration is not interfered with.

X. If possible, the patient's chest and abdomen should be exposed during chloroform inhalation, so that the respiratory movements can be seen by the administrator. If anything interferes with the respiration in any way, however slightly, even if this occurs at the very commencement of the administration, if breath is held, or if there is stertor, the inhalation should be stopped until the breathing is natural again. This may sometimes create delay and inconvenience with inexperienced administrators, but experience will make any administrator so familiar with the respiratory functions under chloroform that he will in a short time know almost by intuition whether anything is going wrong, and be able to put it right without delay before any danger arises.

XI. If the breathing becomes embarrassed, the lower jaw should be pulled, or pushed from behind the angles, forward, so that the lower teeth protrude in front of the upper. This raises the epiglottis and frees the larynx. At the same time it is well to assist the respiration artificially until the embarrassment passes off.

XII. If by any accident the respiration stops, artificial respiration should be commenced at once, while an assistant lowers the head and draws forward the tongue with catch-forceps, by Howard's method, assisted by compression and relaxation of the thoracic walls. Artificial respiration should be continued until there is no doubt whatever that natural respiration is completely re-established.

XIII. A small dose of morphia may be injected subcutaneously before chloroform inhalation, as it helps to keep the patient in a state of anæsthesia in prolonged operations. There is nothing to show that atropine does any good in connection with the administration of chloroform, and it may do a very great deal of harm.

XIV. Alcohol may be given with advantage before operations under chloroform, provided it does not cause excitement, and merely has the effect of giving a patient confidence and steadying the circulation.

35. The commission has no doubt whatever that, if the above rules be followed, chloroform may be given in any case requiring an operation with perfect ease and absolute safety so as to do good without the risk of evil.

EDWARD LAWRIE (*President*),
T. LAUDER BRUNTON,
G. BOMFORD,
RUSTOMJI D. HAKIM,
} *Members.*
EDWARD LAWRIE, *Surgeon Major.*

HYDERABAD, December 18, 1889.

(True copy.)

THE FATAL AFTER-ACTION OF CHLOROFORM.

A new phase of the chloroform question is touched upon in a paper by OSTERTAG, published in the *Deutsche Medizinal Zeitung* for January 16, 1890. In the literature of the fatal cases of the administration of chloroform as an anæsthetic a few are on record where death was only produced a number of hours after the production of the narcosis. Thus Langenbeck published in 1850 a case of death after extirpation of the shoulder, which occurred seventeen hours after the operation. Berend also published cases in which death did not occur until sixty hours after the production of narcosis. Ungar and Strassmann called attention to the fact that chloroform inhalation in certain instances had produced fatty degeneration of internal organs, especially of the heart and liver, but without producing any detectable alteration in the blood. These results seem to have attracted but little notice, though it is evident that they should draw attention to a possible phase of chloroform death which is worthy of a careful study.

The author's experiments were made on rabbits, guinea-pigs, rats, cats, dogs, and pigeons by the administration of chloroform by inhalation, two animals of each species being kept for comparison with those to whom the chloroform had been administered. It was found that in apparently perfectly normal rabbits the inhalation of chloroform was followed by marked fatty infiltration of the liver and fatty degeneration of the muscular fibrili of the heart. In guinea-pigs there was likewise a fatty degeneration of the myocardium of the muscular part of the diaphragm, as well as of the kidneys and liver. In rats, in addition to the accumulation of oil globules in the liver-cells, no especial feature is noted, while in perfectly normal guinea-pigs, in addition to the liver and kidneys, a pathological fatty formation was also found in the skeletal muscles. In cats the fatty deposits were especially confined to the epithelium of the liver and kidneys, while the other organs, especially the heart, were free. In dogs there was a slight fatty infiltration of the liver, and a great accumulation of oil globules in the urinary canals. The results thus show that the effects of chloroform differ very considerably in different groups of animals. While Ungar and Strassmann found that two to three hours narcosis with chloroform was sufficient to cause death in the rabbit, and Dr. Thien notes that the rabbit which for three successive days was chloroformed for eight hours, died eight hours after the last inhalation. In the experience of Dr. Ostertag thirteen hours consecutive chloroforming was insufficient to produce death in the two rabbits on which he experimented. Of the three guinea-pigs which were chloroformed for six and a half hours and thirteen and a quarter hours, respectively, one died twelve hours and the other twenty-four hours after the first narcosis. The third was killed six days after a twelve hours' inhalation. In these animals, in addition to the reaction of the biliary coloring-matters in the urine, there was found a fatty degeneration of the heart, of the kidneys, and of the stomach, and marked fatty infiltration of the liver. In the case of rabbits, of ten occasions in which narcosis was produced, in only one did death follow in that instance after a chloroforming of ten hours. The tissue change in these animals was very slight, probably, as the author suggests, because rabbits are extremely susceptible to chloroform, and therefore but a very slight amount in spite of the long duration of the anæsthesia could be administered to them. Instead there was found in these cases fatty methæmoglobin of the liver, heart, and kidneys, while the coloring-matter was in one case found in the liver and in another case the renal epithelium was stained yellow. Of the four pigeons, one died nineteen and a half hours after an anæsthesia of two hours' duration ; there was then found marked fatty infiltration of the liver and slight fatty degeneration of the kidneys. Fatty degeneration of the heart was especially marked. In seven cases of chloroform inhalation in cats, death occurred four times, six, eight, and in two instances, twelve hours after the last narcosis, the fatal result being produced by the inhalation of from only two and a half hours to four hours. In all cases there was found fatty degeneration of the liver and of the heart, and of the skeletal muscles, while in one case fatty emboli were found in the lungs. In two biliary coloring-matter was found in the urine. Of eight dogs, five died as the result of the after-effects of chloroform after eight hours after an inhalation of four and a half hours, another six hours after an inhalation of four and three-quarter hours, another six hours after an inhalation of eight and three-quarter hours, another six hours after an inhalation of ten hours, and another twenty-seven hours after an inhalation of fifteen and three quarter hours. In these instances there was found fatty

degeneration of the liver, fatty degeneration of the myocardium and diaphragm, and in the highest grades of poisoning fatty degeneration of the skeletal muscles, of the kidneys, and of the stomach. Biliary coloring-matters in the urine, accompanied by jaundice, occurred in all cases, while in one case albinuria, hæmoglobinuria, and hæmoglobinæmia were present. The author explains the results, when occurring in the renal and gastric epithelium, as attributable to true fatty degeneration; when occurring in the liver, as due only to fatty infiltration. The author likewise calls attention to the alterations produced in the blood, as the result of the action of chloroform, and claims that a great number of the deaths are due to disturbance in the respiratory functions of the red blood-corpuscles, although a number of factors are likewise concerned in the production of this result. The author finds that fatty metamorphosis of the cardiac muscle is one of the causes of death. He claims that it is quite conceivable that the preliminary stages of fatty degeneration, even although not having passed to a complete degeneration, may be concerned in the reduction of the functional activity of the heart. Fatty degeneration of the skeletal muscles, which was especially noted in the diaphragm, may likewise prove an important factor in the disturbance of respiration. While of course the depressing action on the respiratory centre is likewise of prime importance. Further than this, the interference of the respiration leads to the accumulation of carbon dioxide in the blood, and this may act as a depressant on the heart-muscle. Of course, it will not do to apply these results, without further study, directly on man, for it is quite conceivable that there may be as marked differences between the action of chloroform on man and the lower animals, as were noted in the different groups of animals experimented on by the author.

The author formulates his conclusions as follows: 1. After prolonged inhalation of chloroform, fatty degeneration of different organs, especially of the heart, liver, skeletal muscles, kidneys, and stomach occurs in animals of widely-different species. 2. The fatty degeneration is the result not only of the action on the blood, but the structure of the red blood-corpuscles; also a direct local action on the tissue-cells themselves. 3. Certain individuals show such great susceptibility to the action of chloroform by inhalation that they rapidly succumb to its influence. 4. The fatal after-effect of chloroform is attributable to paralysis of the heart, and it is evident by an anatomical degeneration of the myocardium, although in certain cases this may only with difficulty be detected, and to a gradual accumulation of carbon dioxide in the blood.

THE RELATION BETWEEN PERIPHERAL IRRITATION AND NERVOUS PHENOMENA, WITH SPECIAL REFERENCE TO EYE-STRAIN.

At the meeting of the New York Academy of Medicine, in the Section in Neurology, held December 13, 1889, Dr. M. Allen Starr read a paper with the above title (*New York Medical Journal*, January 18, 1890). He said that the question of the exact relation between peripheral irritation and serious nervous phenomena was not a new one, but had been brought into prominence of late by those who had paid some attention to the study of eye-strain. It was maintained by these recent writers that irritation arose from a lack of balance between the various ocular muscles, and was sufficient to produce various general nervous manifestations, and even such diseases as epilepsy and chorea. The enthusiasm of the exponents of this method equalled that displayed in former years by others who had worked along the same lines. Genital irritation was urged at one time by a distinguished surgeon as a cause of paraplegia. For a time circumcision was regarded as indispensable in the treatment of many nervous diseases, such as infantile paralysis and spastic paraplegia. Subsequently, congenital stricture of the urethra was brought forward as a cause of many neuroses and temporary states of nervous excitability. Recently it had been taught that the peripheral irritation of nasal obstruction was responsible for many respiratory neuroses, of which asthma might be taken as a type, while the ear and its canals, and even the teeth, had not been neglected by those in search of hidden seats of nervous affections. It was not strange, therefore, that to the influence of modern fashion certain ophthalmologists should have yielded, and that inasmuch as the exact relation between internal eye-strain and nervous symptoms had long been ascertained, they should have fallen upon external eye-strain as the sole remaining *point d'appui*. The object of this glance at past investigations was very largely intended not to throw ridicule on them, but to emphasize the fact, which could not be denied, that though each form of peripheral irritation might produce

nervous symptoms, no one form had such a special importance as to warrant the extravagant statements made by its earliest supporters. It had been the history of progress in every line of medical research which had been repeated in this particular. First, extravagant assertions based on hypotheses; then important opposition and negation; lastly, calm, judicial conclusion that truth lay in neither extreme. While it was undoubtedly true that many nervous disorders were produced secondarily by local irritations, it was also true that nervous affections so produced bore very different characteristics from cases of true epilepsy and the well-known forms of mental diseases. When peripheral irritation existed sufficient in degree to be in any way injurious, it might be stated, as a rule, to which there were only occasional exceptions, that nature pointed it out by producing a sense of discomfort or of pain in the part irritated. The proposition had been advanced within the past few years that insufficiency of the ocular muscle was a frequent cause of functional nervous diseases, such as epilepsy and chorea. Any one familiar with muscular physiology knew that muscular power varied constantly. Effort strengthened it if moderate, and weakened it if too long continued. Rest increased it if moderate in duration, but atrophy was the result if too prolonged. The smaller the muscle the greater the relative degree of variation. The speaker had been, during the past three years, constantly testing ocular muscles as to their power, and he had observed under the same tests in the same individual, at different times, considerable variation. He also found a relation between the patient's general condition and the power of these muscles. In neurasthenia and other functional diseases the ocular muscles would at one time show a relative weakness and at another time the test would be negative; but, as these patients recovered, under treatment, their general strength and tone, a proper strength and balance of these muscles returned. In epilepsy there was often very evident variation in the equilibrium of the ocular muscles, to the tests, before and after an attack.

It was the opinion of the speaker that in normal individuals and in those affected by functional diseases the power of the ocular muscles varied considerably from time to time. It was well known by those who were doing much testing with prisms that continued efforts on the part of one or more of the ocular muscles very soon elicited complaint from the patient. In a word, a real strain of an ocular muscle produced discomfort. It was the speaker's experience that, unless an extreme degree of ocular insufficiency existed, patients did not suffer discomfort. It was also his experience that, in functional neuroses of any kind, the moment a patient's attention was directed to an organ, he became conscious of sensations in that organ which might be perfectly natural and yet which he believed to be abnormal. Spontaneous testimony was, therefore, more valuable than if suggested. The conclusions were those drawn from spontaneous testimony, that slight ocular insufficiencies did not produce discomfort; that, in view of the facts already established, variations in the muscular power were natural, and that nature warned us of overexertion in any direction by means of conscious fatigue. It became evident, then, that insufficiency of an ocular muscle incapable of causing discomfort was really a matter of very little importance. The review of the subject of peripheral irritation in general had shown that any such irritation of a serious nature or of long continuance was capable of producing nervous manifestations in a nervous person, and that such irritation, by giving rise to discomfort or pain, was indicated by nature as the cause of the symptoms. Out of three thousand cases of nervous disease, the speaker could cite only one case of true nervous manifestation undoubtedly caused by eye-strain, and in his opinion such cases were rare. It had been a matter of dispute whether so-called reflex disturbances were identical with serious nervous diseases,—such, for example, as hysteria, chorea, and epilepsy. The nervous manifestations arising from peripheral irritation when carefully studied differed from the ordinary neuroses in their history, and therefore presented features which were characteristic. The conclusion, therefore, which seemed inevitable was that while eye-strain or other peripheral irritation might be a source of nervous manifestation, it was a rare cause of nervous disease. The speaker would class eye-strain, either from muscular insufficiency or from errors of refraction, with other kinds of peripheral irritation, neither more nor less frequent and important. He considered it necessary to ascertain in any case of nervous diseases whether any form of peripheral irritation was present. But, unless it had been spontaneously observed by the patient, he would not attach much importance to its presence as an etiological factor unless the nervous manifestations were of such a character and mode of development as to point to a peripheral origin. The speaker did not believe that true epilepsy or

chorea could be produced by eye-strain or cured by its relief, and thought that the general indiscriminate recommendation of treatment directed to the relief of supposed eye-strain in these diseases would soon come to be recognized as malpractice.

Dr. Sachs thought that the paper was not open to discussion so far as he was concerned, because he quite agreed with the author's views, and thought that all neurologists would be unanimous in expression of similar opinion. He deprecated the extravagant way in which cases of reflex neuroses had been operated on. He considered that no difference existed between the neurotic symptoms and the supposed reflex origin of those symptoms. In cases of intestinal irritation due to parasitic invasion it was true that convulsions occurred. In such cases as he had had an opportunity of keeping under observation for years these symptoms had occurred once or twice. No other symptom could be properly classified as due to reflex origin. Even headaches accompanying eye-strain, or reflex headaches from trigeminal neuralgia or dental difficulty, were no more of reflex character than a pain in the thigh due to neuritis in the sciatic nerve. It was the direct irritation of the terminal ends of the nerve which was responsible for the pain, and there was nothing reflex about it. He thought that many of the cases of facial chorea, facial twitching supposed to be due to nasal obstruction, and, treated accordingly, would do much better under the ordinary treatment for chorea. He thought this subject had been overdone generally. There was no more reason for referring epilepsy to eye-strain than there would be to refer spinal epilepsy to phimosis.

Dr. Knapp said he had not seen that nervous symptoms had been at all improved by treatment directed to the eye, outside the inability to use the eye and the discomfort which, of course, was real. Headaches due to insufficiency would disappear upon the proper correction of the errors of refraction, and this was one of the most thankful tasks the eye specialist had to perform. The exaggeration lay in assuming that the most minute degrees of insufficiency called for operation.

Dr. Roosa, in the course of his remarks, said that in his opinion there never had been anything in the doctrine which advocated the operation on slight degrees of insufficiency for the cure of epilepsy and chorea. He had never felt any particular interest in the discussion, but it had served to bring out a few points, and would, he hoped, settle them forever. The conclusions of the author's paper were as nearly in accord with conclusions of his own as they could possibly be made.

Dr. C. S. Bull spoke in strong terms of the effect of the present method of living in this country, and especially in New York. The high nervous tension necessary to the fulfilment of the business and social requirements he considered answerable for the extreme prevalence of neuroses of all kinds. The partial tenotomy of the ocular muscles for producing any lasting effect in the direction alleged for the operation was absurd. The prismatic test of the muscular strain was the proper evidence for determining whether partial or complete tenotomy was to be done.

Dr. Birdsall said that he heartily agreed with the conclusions of Dr. Starr. Still, he thought, there existed a class of cases in which there might be a reflex element from peripheral irritation, which set up a train of nervous disturbances and symptoms, the removal of which might bring relief. He thought that a certain instability in the condition of the nerves, existing in some individuals, was enough in this class for a very slight peripheral irritation to set up a very profound disturbance. No matter what the operation might be which was undertaken for the relief of this class, such patients would continue to present themselves with the same or some allied symptoms. He believed that an effort should be made, when there existed evident disturbance in the function of an organ, to restore the lost equilibrium of the muscles, or between sets of muscles. Of course, some cases, in which the conditions arose out of hereditary tendencies, might be beyond relief by operative interference, but many of the cases were dependent upon present inaccuracies of habit, overwork, over-excitement, or other causes.

Dr. Mary Putnam Jacobi said that the title of Dr. Starr's paper covered much more ground than its subject-matter did. Taken in its widest sense, the "relations of peripheric lesions to sensory phenomena" might be said to embrace the entire range of organized life, at least, if we substituted the term "impressions" for that of "lesions." The fundamental function of the nervous system was directed towards the central co-ordination of the multitudinous impressions which were incessantly impinging upon the periphery of the organism, and to the direction of the resultant impulse into motor channels. Hence it was to be expected that disordered phenomena would arise, either when there were morbid impressions, or when the central co-ordination of normal im-

pressions was defective, or when the channels of centrifugal impulse were blocked or impeded. The peripheric projection of central processes further complicated these complex relations. We all knew of the distinct sensations of the extremity of amputated limbs when the nerves of the stump were irritated. Weir Mitchell had given some remarkable examples. The hallucinations of hearing in the insane illustrated the double possibility of causation for the same phenomenon. The auditory phenomenon might be excited entirely by irritation of the brain centres, or lesions of the labyrinth or middle ear might be the proximate occasion for delusions of whispering, of persecution, etc. These delusions were only excited in a predisposed brain, and the fact illustrated the fundamental doctrine in the whole matter,—namely, that peripheric impressions, however morbid, could not excite central phenomena unless the nerve-centres were already predisposed. The train must be laid; then, but not till then, the touch of a match would cause an explosion. In grave hysteria the central predisposition predominated, or existed alone, and innumerable peripheric symptoms were to be regarded as projections of central processes, as cerebral hallucinations of pain or motor irritation. On the other hand, utero-ovarian disease might cause hysteroid symptoms even in persons of quite normal nerve-centres, but these differed from true grave hysteria. But it was surprising how the suffering from utero-ovarian disease varied, not in proportion to the extent of the disease, but to the sensibility of the nerve-centres towards which its irritations irradiated. The speaker had been much struck with Dr. Starr's remark that epileptoid, hysteroid, and choreoid symptoms, dependent on peripheric lesion, would be distinguished objectively from true epilepsy, hysteria, and chorea; and especially that the epileptoid attacks were remarkable for their sudden frequency, while in true epilepsy the attacks at first came on at long intervals. She had recently seen this observation confirmed in a little boy of 4, where an operation for circumcision, plus bromide treatment for eighteen months, had entirely cured an onset of rapidly recurring attacks resembling *petit mal.* In the most striking and authentic cases of remote effects from peripheric lesions the effect consisted in some isolated symptom that was quite different from a complex disease. The most famous class of cases were the so-called reflex paralyses, attributed by Brown-Séquard to vaso-motor spasm in the nerve-centres, to Leyden to ascending neuritis, by Jaccoud and Weir Mitchell to exhaustion from shock, by most recent writers to inhibition. Brown-Séquard's theory was entirely exploded; but it seemed as if the three remaining theories might all apply to different cases, but especially the doctrine of inhibition. Weir Mitchell had related in detail seven cases of paralysis of one or more limbs occurring suddenly at the same moment as dried paralysis from traumatism of another limb. Paraplegia from utero-ovarian disease undoubtedly existed, but the question always arose whether it was produced by direct inhibition of the lumbar-cord centres or whether it could be due to a coincident hysteria. The speaker had observed one case where a profoundly neurotic girl of 20, after suffering for some time from moderate ovarian paræsthesia in the abdominal region, had become suddenly but incompletely paraplegic. A few months later Dr. Thomas had found a prolapsed ovary, but distinctly denied any "reflex" character to the paraplegia, which he called "hysterical." It had continued to grow worse until the girl had been unable to execute the slightest movement of the lower limbs, even the toes. She had remained bedridden for eight years, and had then been considered by a neurologist to have an incurable myelitis. She had suffered terribly from dysmenorrhœa, by which she had been prostrated for nearly three weeks out of every month. For this Dr. Mundé had been consulted, who, having tried many other means without success, had removed the ovaries simply to relieve the suffering, and without expecting to affect the paralysis. But in ten days after the operation the patient could move her toes, and in a short time recovered her ability to work. She was also relieved of her menstrual suffering, but remained a good deal of an invalid. Dr. Mundé reported the ovaries as macroscopically normal in structure, although prolapsed. Like Dr. Starr, the speaker had read with great interest the recent paper by Dr. Goodell. Certainly its statements could be endorsed, that there had been an immense exaggeration in referring symptoms of all kinds to entirely insignificant lesions of the utero-ovarian system, or even in assuming the necessary existence of these lesions where they could not be tangibly demonstrated. The course of reasoning in such cases implied often a wilful lack of logic and of care in analyzing the proportion of evidence, perhaps also deliberate neglect of the pathological laws of all parts of the organism beyond the range of the specialist. The speaker could not refrain from noting that, had such errors been committed

by any special class or race, or by practitioners of one sex alone, they would have been deemed sufficient to pronounce that sex quite incompetent for practice.

Dr. L. H. Sayre spoke in advocacy of the benefits to be expected from operative interference for nervous phenomena obviously due to reflex causes originating in the genitals of young persons.

The Chairman said that he had known cases of nocturnal incontinence, and of night-terrors in children, to be cured by cutting off the prepuce. He had seen cases of epilepsy benefited by this operation, and had operated on quite a number of epileptics, and seen them improve after circumcision. To satisfy himself, however, he had in two cases cut out a large area of skin from the back. These two patients had improved just as much as those in whom the operation for phimosis had been done. Another patient, who had been having five to ten epileptic attacks a day, had come to the city for advice and treatment, and did not have a single attack while here, the fits coming on again when the patient returned home. Some patients would have a series of seizures during several months, when these would cease perhaps for years. He had never seen anything but slight improvement follow operations on the ocular muscles or from the use of prisms in epilepsy. As to chorea, he only knew of three cases in which the method had been tried, and not the slightest improvement had resulted. Cases of migraine and of that form of headache which was a neurosis—neurotic, not neuralgic, in character—he had been informed were greatly improved by operation. One case of his own he could also cite,—that of a man of active prominence, who had been incapacitated for a year by some vague form of nervous trouble, and was enabled to return to his work in a short time after his ocular muscles had been exercised by means of prisms. He thought that the nervous systems of such individuals were, as had been suggested, of an unstable character, unable to properly seize and co-ordinate the impressions, and that this very condition of instability which gave rise to the nervous phenomena observed was the condition most likely to respond to operative interference.

Dr. Starr said that he did not wish to deny the possibility of certain reflex manifestations as likely to arise from genital irritation, but believed the underlying condition was an unstable and weak nervous system, and peripheral irritation was only one, and not necessarily an important, cause of certain nervous phenomena.

ANGINA PECTORIS AND PSEUDO-ANGINA.

There are few affections which cause us greater anxiety than the group of symptoms known as angina pectoris; for the fear of sudden death supervening in one of the attacks haunts the unfortunate sufferer. This fear is, as we know, only too well justified; for though the statistics on the point vary very much and cannot be wholly relied upon, yet we know that in a fair percentage, estimated from five to ten per cent., sudden death does take place. We know, also, that in many cases the anginal attacks may occur without a fatal issue, and in some they may after a time completely disappear. It may, therefore, considering the variable prognosis, not be without interest to study more closely those cases which often, in spite of all treatment, terminate fatally, and which are now known as *true angina*, and those where, though the symptoms themselves have all the characters of angina, no fatal result is feared, and which are spoken of as *pseudo-angina*.

Let us consider first the true angina pectoris. Its symptoms consist of paroxysms of pain in the præcordial region, radiating in other directions, especially towards the left shoulder and along the course of the left ulnar nerve, with the feeling of great anxiety, of oppression, with more or less dyspnœa, and of pallor of the face and variations in the pulse.

These symptoms vary very much as to their intensity, and all of them are not always present. Besides the abortive attacks where the symptoms are slight we may, according to the greater preponderance of one or other of them, distinguish several types.

In an elaborate paper read by Dr. Julius Dreschfeld before the Manchester Medical Society, December 4, 1889 (*Practitioner*, January, 1890), the author calls attention to the fact that three different types of true angina pectoris may be recognized,—1, the respiratory type; 2, the neuralgic type; and 3, the vaso-motor type. That such a distinction is not artificial will be seen from the following:

First, as to the *respiratory type*. In most cases of true angina there is not the dyspnœa which we notice in asthmatic attacks; the patient suffers from great oppression in the thorax, the respirations are superficial and irregular, and the patient has a feeling of suffocation; he is unable to move; he stands fixed, and looks for some support. In some few cases, however, there is marked dyspnœa, the breathing is labored, the respirations are

deep, and the patient, instead of remaining fixed to the spot, rushes to the open window or into the fresh air. Such cases are rare, but they are of true anginal nature, and may terminate fatally.

In such cases the symptoms are not relieved through the use of nitrite of amyl or nitroglycerin, but may be removed by a subcutaneous injection of morphine. Post-mortem examination in such cases will often disclose relaxation of the heart, the left ventricle well dilated, and the left coronary artery showing atheroma. The chief symptom is temporarily quickened pulse in addition to dyspnœa.

The *second type* is the *neuralgic type*, and the principal symptom is the pain. This is situated usually beneath the sternum or præcordium, radiating to the left shoulder, and thence along the inner side of the arm to the elbow, or often to the fourth and fifth finger of the left hand. The pain may radiate to the right shoulder and right ulnar nerve, to the left side of the neck, to the back, abdomen, and even lower extremities; the abdominal pain may be situated in the epigastrium, or in the ovaries or testicles. Along with the pain, or often after the pain, we notice numbness and tingling and other abnormities of sensation. When, then, pains are associated with the after symptoms of angina the diagnosis is easy. Sometimes, however, the neuralgic pains may form the chief symptom.

The *third type* is the *vaso-motor type*, which has long since been described as a separate form by Nothnagel. This type is chiefly characterized by vaso-motor symptoms, in some cases following, in others coexisting with, the præcordial pain. There is marked pallor, a quick pulse, regular or intermittent, sometimes with increased, at others with diminished arterial tension. Vertigo, paræsthesia, or anæsthesia of the left arm, or of both arms, are often associated with these vaso-motor symptoms, and flatulence and vomiting occasionally occur towards the close of the attack. The vaso-motor type is especially seen in pseudo-angina; in true angina the vaso-motor symptoms are often preceded by præcordial pain and præcordial oppression.

The most common cause of true angina is some affection of the coronary artery obstructing the lumen of that vessel; the lesion usually found is atheroma of the coronary artery; occasionally thrombosis, embolism, or, especially in younger persons, syphilitic disease of these arteries is seen; so also endocarditis and diseases of the aortic valve are often associated with attacks of angina; in such cases the coronary arteries are easily compressed and their lumen becomes narrowed.

Dr. Dreschfeld explains the mode of causation of the symptoms of angina pectoris as follows: According to Gaskell, the sympathetic nerve with its cardiac terminations is the motor nerve of the heart, and its stimulation causes catabolism or destructive changes; while the vagus is the inhibitory nerve, and its stimulation causes anabolism or constructive changes,—*i.e.*, diminished activity followed by repair of function (Hamilton). From the observations of Dr. Ross we now know that the sensory spinal nerves are closely associated with the visceral nerves; and we know from Dr. Gaskell's observations that the second dorsal nerve is the spinal sensory nerve associated with the sympathetic of the heart.

Now, affections of the coronary arteries produce disturbances in the nutrition of the heart, and we have either acute myomalacia (hemorrhagic infarct), which is an acute affection, and may lead to chronic induration or fatty degeneration, or most commonly we find atheroma of the coronary arteries leading to fibroid changes of the myocardium without myomalacia. A heart so affected may often show only signs of cardiac weakness; but if from some cause, such as increased muscular activity, mental excitement, or alcohol, etc., there is a sudden increase of arterial or intracardiac pressure, the cardiac nerves become irritated, and as the result we have cardiac pain, oppression, and alteration of the pulse. If the sympathetic cardiac terminations are irritated we have the associated pain in the left shoulder, due to the irritation of the sensory branch of the second dorsal, and as the course of these nerves is centripetal we can easily understand the radiation to the other sensory nerves, while irritation of the vaso-motor centre will explain the general vascular disturbances. The pneumogastric, acting as the anabolic nerve, comes into play to restore the function by diminishing the activity of the heart, and thus the paroxysm passes off as the heart is set at rest.

To explain the præcordial pain, some believe that the sympathetic contains sensory fibres; others compare the pain to the cramp-pain often noticed in tonic spasms of a voluntary muscle; while others hold that in the anginal attack both the pneumogastric and

the sympathetic are implicated. Dr. Dreschfeld is inclined to agree with those who hold the last view; the primary cause being a disturbance of the nutrition of the heart, we are more likely to have irritation of both sensory and motor nerves, as seen in the occlusion of peripheral arteries.

The anginal attack is thus, in great measure, due to the want of the proper regulative mechanism between catabolism and anabolism. This explains the varying behavior of the pulse, of blood-tension, etc., in the anginal attacks.

The account we have given as to the causation of the symptoms also explains satisfactorily the unfortunately by no means uncommon termination *in death.*

Death may occur, first, from the unrestrained action of the sympathetic; the pulse gradually gets weaker and quicker, the heart's sounds are scarcely audible, and eventually the heart's action ceases. Secondly, death may be due to a tonic contraction of the heart; and here, again, Gaskell has shown that, when the heart's muscle is exhausted, it behaves like an involuntary muscular fibre, and shows a permanent or tonic contraction. Thirdly, death results from the affection of the centre which presides over the automatic action of the heart, and which resides in the cardiac ganglia. Where no lesions of the myocardium or the coronary arteries are to be found, we may explain the occurrence of sudden death as attributable to sudden spasm of the coronary arteries.

As regards the pseudo-anginal attacks, a hysterical element is in many cases present, or pseudo-anginal attacks may appear in various affections of the nervous system, such as gout, neurasthenia, chronic nicotinism, and affections of the stomach and intestines. While in true angina the cause is invariably to be found in some abnormal condition of the nerves, in pseudo-angina the cause is usually a reflex irritation. We may, therefore, classify the affections in which pseudo-angina occurs under two groups. *One* group consists of those in which there is central irritation, and here the irritation may attack the centre directly or indirectly, the causal agent being of a toxic nature and circulating in the blood. To the first sub-group belong hysteria, neurasthenia, and other affections of the nervous system, such as locomotor ataxy; the *second*, or toxic sub-group, includes gout, chronic nicotinism, chronic alcoholism, excessive use of tea, etc.

To the second group, where the irritation affects the cardiac nerves reflexly, we assign gastric catarrh, nervous dyspepsia, gall-stones, etc. The irritation starts here from the terminal sensory nerves in the different organs, and is reflected to the ganglionic apparatus of the heart. According to some the pseudo anginal attacks in affections of the stomach and intestines are due to the formation of ptomaïnes which are absorbed into the blood, and may thus act either on the centre or on the peripheral terminations of the cardiac nerves.

Dr. Dreschfeld offers a number of points which will aid the recognition of these different forms of angina. Thus, the pseudo-anginal attacks usually occur in persons suffering from hysteria. The hysterical pseudo-angina pectoris is distinguished from true angina by the following points:

First.—The age of the sufferer. Persons suffering from hysterical angina are young, as a rule, yet true angina may occur in young females.

Second.—The attacks occur not after violent exertion, but often without a palpable cause, and at regular periodic intervals.

Third.—The radiation of the pain is along the sternum and along the insertions of the diaphragm at the back.

Fourth.—There is always marked dyspnœa, and the vaso-motor phenomena are very prominent.

Fifth.—The patient shows a great deal of excitement, and there is not the anxious expression of countenance.

Sixth.—The coexistence of other hysterical symptoms, such as hemianæsthesia, contraction of the field of vision, hystero-epileptic attacks, etc.

Seventh.—The absence of any signs of heart-disease.

Again, both the cerebral and cerebro-spinal form of neurasthenia are often accompanied by anginal attacks, the nature of which, however, may be recognized by the fact, *first*, that the attacks come on without any muscular exertion, and after worry or mental trouble.

Second.—The attacks are short. The cardiac pain is not very great, but there is marked pallor and irregularity of the pulse, which often lasts for days.

Third.—The symptoms improve on walking or other slight muscular exercise.

Fourth.—The attacks are often either preceded or followed by insomnia. Of the toxic variety, the best known is the angina occurring in smokers and in gout.

In smokers, anginal attacks are not so rare, and physiological experiments have abundantly shown the effect of nicotine on the vaso-motor nerves, on the pneumogastric, on the muscles, and on the viscera.

The anginal attacks are here preceded by an irregular, occasionally intermittent pulse, by palpitations which persist for some time, and in the attack itself there is cardiac pain, usually limited to the heart, and great oppression. The attack is followed by pallor and sweating, and the pulse may then become slow, and show increased arterial tension, or remain quick and intermittent for some time.

The symptoms disappear as soon as the patient gives up smoking. In considering this form of angina one has, however, to bear in mind that occasionally excessive smoking may lead to atheroma and to affections of the myocardium and valves of the heart, and thus true angina may occur occasionally in chronic nicotinism.

In gout we often meet with true angina, yet pseudo-angina does occur; and here, again, the absence of cardiac hypertrophy and of atheroma will assist us in the differential diagnosis. The pain is characterized by a more limited pain over the heart, by general vaso-motor disturbances, and especially also by an irregular and intermittent pulse, which may last for many weeks or even months.

Finally, gastric and intestinal affections produce anginal attacks in a reflex way. Palpitations, an intermittent and irregular pulse, with more or less dyspnœa and general discomfort, are often noticed in dyspeptic persons and in affections of the liver. Occasionally, however, we have in these diseases pseudo-anginal attacks.

These attacks are characterized by the following features: First, they come on after meals; secondly, there is often epigastric pain, with associated pains in the back from the fourth to the sixth dorsal nerve; the anginal pain is præcordial, rarely substernal, and not so severe as in true angina; the pulse is irregular; there is pallor, with often profuse sweating. The attack often lasts several hours. According to Huchard, there is in these cases evidences of dilatation of the right heart and increased tension in the pulmonary artery, and this is in accordance with the results obtained by Morel and Arloing, who found that on irritation of the exposed mucous membrane of the stomach, a manometer being inserted in the pulmonary artery, a rise of blood-pressure was noticed.

The therapeutics of angina are now so well known that but little mention is required. Apart from the treatment of the primary affection which gives rise to the symptoms, there is the treatment of the attack itself. Of the nitrites, the nitrite of amyl acts quickly, but its action is of very short duration; nitroglycerin, on the other hand, has a more permanent effect, and may be given for a few days following the attack. In the case of angina, where the chief symptom is dyspnœa, the nitrites have no effect whatever, and in the pseudo-anginal attacks of neurasthenia, gout, and chronic nicotinism they are often of little use. The good effects of morphine are too well known to be mentioned. Morphine should, however, be avoided when the pulse is feeble and quick, and when there is great pallor with profuse perspiration. The inhalation of chloroform has been recommended by several authorities. Dr. Dreschfeld has only tried it in two cases, and in one, very soon after the inhalation, the pulse became irregular, thread-like, and collapse set in. He therefore offers a caution against its use. Subcutaneous injections of ether have several times been found useful where the heart's action appeared very weak.

TREATMENT OF GOITRE BY INTERSTITIAL INJECTIONS OF TINCTURE OF IODINE.

Several years ago, Luton, of Rheims, proposed the treatment of goitre by the intraparenchymatous injections of undiluted tincture of iodine. This method was afterwards adopted and commended by Professor A. Lücke, and by Duguet; the latter has published a memoir on the subject, in which he has reported numerous successes.

TERRILLON, surgeon to the Salpêtrière, has published, in the *Bulletin Général de Thérapeutique*, a communication in which he advises the iodine injections in bronchocele as more likely to give curative results than those of tincture of iron or of ergotin, counselled by former surgeons; and he gives minute directions how to carry out this treatment successfully.

In order properly to practise this injection, says Terrillon, there are three points indispensable to know:

1. The operator must be sure that he has penetrated the substance of the tumor before pushing the injection.

2. He must avoid, as far as possible, transfixing the veins which ramify in the cellular tissue in front of the neck. In fat patients the veins are not very apparent, and it is desirable, before inserting the needle, to find a place where no veins shall be in the way. The patient should be made to take a full breath, during which the swollen jugulars become prominent, and they can then be very easily avoided.

3. The third important point is to have a hypodermic syringe that is perfectly clean, in order to avoid the introduction of infectious germs. Terrillon recommends that the syringe with its needle should be left a certain time in boiling water before being used.

After having taken these precautions to obtain asepsis of the instrument, and, after having chosen the place to make the injection, the operator takes the needle and plunges it slowly, but without hesitation, into the hypertrophied thyroid body. To avoid the infiltration of liquid in the cellular tissue of the neck, it is necessary to insert the needle to the depth of at least two or three centimetres, and to be assured, by the movements impressed on the tumor and by the feel of the needle, that the latter has penetrated the glandular substance. Having introduced the needle deep into the thyroid body, the surgeon unscrews and removes the syringe before making the injection, in order to see whether any blood flows by the canula. This precaution is needful in order to avoid the injection of iodine into the interior of a vein. If blood should flow at the point of puncture, another place is chosen, and the same manœuvre is repeated.

After being assured that a vein has not been pricked, the syringe is readjusted, and half a gramme of pure tincture of iodine is injected into the tumor. If this injection is well supported, if the patient experiences no other symptoms than a slight pain with a little swelling, the next time a whole syringeful is injected. After having made the injection and introduced the desired quantity of liquid into the tumor, the needle is not immediately removed, but is left a few seconds, in order that the liquid may be sufficiently diffused into the parenchyma of the gland, and that it may not flow into the subcutaneous cellular tissue.

Terrillon recommends to make but one injection at a time, and to have four or five days' interval between the injections, in order to guard against the danger of iodism. A little pain immediately after the operation at the site of the puncture, followed by shooting pains into the back of the neck, the lower jaw, or even the shoulder, should not give alarm, as these pains are rarely of long duration. Sometimes the patients taste iodine in the mouth after the injection, due to the elimination of iodine in the saliva. A little swelling follows the injection; this rarely goes on to suppuration.

Cases have been recorded where goitre has been benefited and even cured by one injection of tincture of iodine. Ordinarily the injections have to be repeated several times, and sometimes as many as twenty are required to bring down the thyroid body to its normal volume. At the point where the iodine is injected, there takes place a destruction of the tissue elements, which undergo fatty transformation, and end in being absorbed. The irritation of the tissues causes the formation of a point of cicatricial tissue, which, in undergoing retraction little by little, produces shrinkage of the tumor. The injection of iodine acts, then, by provoking the fibrous transformation of the goitre. A sufficient number of injections must be made, so that all points of the thyroid body may be brought under the influence of the medicinal agent. In this way complete atrophy of the morbid growth is eventually obtained.

Terrillon believes that the tincture of iodine constitutes the most efficacious treatment of goitre. At the same time, other irritant liquids may be injected into the thyroid body, such as a ten per cent. solution of iodoform in ether. This acts in the same way, by provoking a non-suppurative inflammation of the tumor. Fowler's solution has been employed, but this is toxic, and can with safety only be injected by drops. Moreover, it is not so certain in its action as iodine; and the same may be said of ergotin, which was formerly much used in parenchymatous injections from the supposed power to cure atrophy of the hypertrophied gland-elements by lessening the blood-supply.—*Boston Medical and Surgical Journal*, January 16, 1890.

AURAL COMPLICATIONS IN ACUTE SPECIFIC FEVERS.

At the meeting of the Harveian Society, held January 2, 1890, Dr. Hill remarked that more than fifty per cent. of the cases of chronic ear-diseases commencing in early life were traceable to the aural complications of fevers (*Lancet*, January 11, 1890). The

somewhat higher percentage observed before Meyer demonstrated the importance of naso-pharyngeal observations were doubtless due to the fact that the exanthemata are potent exciting factors in the induction of adenoid overgrowth of the pharyngeal tonsil in those of "lymphatic temperament," and indirectly of ear lesions, and cases now rightly attributed to post-exanthematous "adenoid growths" were formerly classed among the direct aural complications of acute fevers. After detailing English and foreign statistics dealing with the frequency of ear symptoms in the course of scarlet fever, measles, whooping-cough, mumps, and other states, the destructive nature of these complications on the membrana tympani and ossicula, if untreated at the time, was pointed out and contrasted with the rapid recovery from perforation, discharges, and impairment of function when similar conditions were not neglected, but treated *secundum artem*. In measles, pneumonia, and pertussis, in which the inflammation spread up the Eustachian tube, the otitis could often be prevented, and nearly always arrested or limited to the non-suppurative variety by appropriate naso-pharyngeal and inflation treatment. If neglected, suppuration of the middle ear resulted from tubal obstruction and accumulation and retention of tympanic secretion; the tendency to this acute suppurative stage was more marked when the middle ear became involved in scarlet fever, small-pox, and diphtheria, and if unrelieved by immeate incision of the membrane on the onset of pain or evidence of intratympanic accumulations, the destructive processes above alluded to resulted, and frequently also involved the labyrinth. If, on establishing proper drainage, together with frequent syringing of the meatus with antiseptic lotions and inflation by the tube, the pain was unrelieved, the application of leeches or incision for mastoid inflammation, and of Leiter's continuous cold coil for less limited pain, was recommended. The use of internal anodynes also afforded relief in some instances; but if a thorough otological examination was not made and appropriate surgical measures adopted, the mere relief of pain often lulled to false security, while irreparable destruction was going on in the delicate auditory organ. In cerebro-spinal fever, mumps occasionally, and in typhus, the labyrinth was usually primarily involved. Such a complication might be aggravated by such remedies as salicine or quinine, which were best avoided in acute aural disease; iodide of sodium internally, or pilocarpine hypodermically, being the most serviceable drugs. In conclusion, Dr. Hill pleaded that aural symptoms should invariably be looked for early in the course of fevers, in the same way that the thoracic and renal organs were watched. With appropriate nasal and pharyngeal treatment, otitis could often be prevented or mitigated in severity. If enlarged tonsils or adenoid growths interfered with treatment they should be removed. While anodynes were indicated for pain, other treatment, including early incision of the tympanic membrane, were necessary in order to limit rapidly destructive suppurative processes in the middle ear and labyrinth.

The PRESIDENT remarked upon the extreme importance of diminishing in any way the great dangers which resulted from ear-disease caused by the specific fevers. Those who met with many cases of cerebral abscess and other brain lesions from this cause would best appreciate the points of Dr. Hill's paper.

MR. LENNOX BROWNE said the anodyne treatment led very often to a fool's paradise. He thought that a rise of temperature in the course of a specific fever was a guide to the diagnosis of ear-trouble as of other complications. Some of the ear troubles of acute fevers were, indeed, due to pharyngeal and not primary aural trouble, but only when there was no discharge from the external meatus. When discharge was present there was always aural disease. The order of importance of the specific fevers in relation to the production of aural trouble was, in his experience, the following: scarlet fever, measles, pertussis, and mumps. Purulent catarrh was rare in diphtheria. He himself would not incise the tympanic membrane unless there was very great congestion or evidence of fluid in the ear. There was no danger of leaving a hole in the tympanic membrane after such an operation. When, however, rupture of the membrane resulted from ulceration, a permanent opening was frequently left. Unlike Dr. Hill, he had found atropine of great service in relieving aural pain. He supported Dr. Hill in his recommendation to scrape the throat free from growths even during an acute fever.

DR. SPICER inquired as to the method of using pilocarpine. An enlargement of the pharyngeal tonsil should be treated before an acute specific fever occurred.

DR. HILL, in reply, alluded to the difficulty

of obtaining good nursing for cases of ear-disease. Pilocarpine should be injected subcutaneously in the form of a two per cent. solution. He also thought pertussis of some importance in the production of aural trouble.

THE RATIONAL TREATMENT OF BRONCHIAL ASTHMA.

In the treatment of asthma the most important factor is, of course, the recognition of the starting-point of the paroxysm. According to FREDERICK I. KNIGHT (*Boston Medical and Surgical Journal*, January 23, 1890).

The factors, whose combination produces a fit of asthma, are—

1. The neurotic habit.

2. A morbid condition somewhere in the respiratory tract, it may be in the upper air-passages or in the lungs themselves, whose irritation shows itself by a reflex exhibition in the bronchial tubes.

3. The exciting factor, which may be atmospheric, digestive, mental, or other remote irritations, which act by reflex on the bronchial tubes.

All treatment of asthma is naturally divided into what may be done for the relief of the paroxysm, and what may be directed to the underlying causes, and which, therefore, may be considered more in the light of cure. For this reason it is the second factor which we are most anxious to remove, if it can be done. Whether this factor is always necessary,—that is, whether there must be something morbid in the respiratory tract, or whether we may have bronchial asthma with a perfectly healthy respiratory area is not, perhaps, definitely settled, but there is no doubt but that we usually have this factor.

In the first place, various morbid conditions of the upper air-passages are productive of asthma, such as polypi, a deflected septum, hypertrophied turbinated bodies, and adenoid vegetations in the naso-pharynx. Unfortunately, however, although removal of these obstructions may for a time relieve the asthmatic attacks, they may recur very soon without anything in the nose to account for it. Certainly it behooves us in every case of asthma to make sure that we leave no nasal obstruction which is capable of relief.

In the conditions where the improvement from operation is only temporary, or in which no nasal disease is to be found, we must, of course, look for medical aid, and it should here be noted that, while in some cases one drug which had proved inefficacious, in another instance of asthma in this case will prove of great benefit. Probably no one remedy has given as much relief to asthmatic patients as potassium iodide,—a remedy which acts directly upon the bronchial tubes. The cases in which Dr. Knight thinks this remedy is most apt to give relief are those in which there is present more or less bronchitis, as it may be expected to thin the bronchial secretion, and possibly facilitate expectoration; further, it depresses the heart and lowers blood-pressure. It may also act in somewhat resolving old thickenings in the bronchial tract, which serve as a source of irritation. A large dose is often necessary for relief, and rapidly-increasing doses may be given until 20, 30, 40, or more grains are given three times a day. It should be given on an empty stomach, largely diluted with milk, and without any admixture of syrups. The iodide seems especially serviceable in cases which are hyperæmic, or due to the vaso-motor paresis. In those cases in which it would seem as if bronchial spasm was the principal feature, the use of the nitrites gives relief. The amyl nitrite, nitroglycerin, and sodium nitrite, theoretically, should all have about the same action, but the author states that he has never been able to get the same decided effect from the sodium nitrite as from the others, perhaps because too small doses were employed. Arsenic and strychnine relieve, probably, by their action upon the neurotic base. They are particularly indicated in what are called the paralytic cases, in which there does not seem force enough in the respiratory muscles to empty the lungs of air.

In seeking to obtain immediate relief from the paroxysms of asthma, assistance may be found in some cases from a subcutaneous injection of morphine, the relief from which is more lasting than that obtained from other drugs. Asthma may in one case be due to a spasm of the bronchial muscle, and in another to vaso-motor paresis; therefore the subcutaneous injection of morphine is more apt than any other drug to give a favorable result. Still, it is true, that while in many cases it would prove highly successful, yet in others it will entirely fail to give relief and may even induce an attack. Dr. Knight explains the relief which morphine gives as due to its producing contraction of the small vessels, so relieving the hyperæmic form of asthma, while the spasmodic form is relieved, on the other hand, by its direct sedative action on muscular tissue. On the other hand, the fact that

morphine sometimes produces an attack of asthma is explained by its reducing the sensibility of the respiratory centre, inducing an attack in the same way as sleep does. The nitrites, in one form or another, give relief to many cases. This has been usually ascribed to direct sedative action upon the bronchial muscles. Dr. Knight suggests that, perhaps, in those cases which seem not to be relieved, but even to be aggravated by them, that there may be already a vaso-motor paresis, which is aggravated by the nitrites. Grindelia gives relief in very many cases, apparently acting as an antispasmodic, as lobelia does, but is a much safer remedy than the latter. Coffee, according to Hyde-Salter, acts by counteracting the tendency to sleep, and the consequent diminished sensibility of the respiratory centre.

Dr. Knight thus calls attention to two very important points,—first, that certain cases are relieved by operative means in the upper air-passages; and, second, that the pathological conditions in an attack of asthma are not necessarily always the same, and relief is only to be expected by a correct recognition of the cause of the paroxysm.

SURGERY OF INFANCY AND CHILDHOOD.

At the meeting of the Medical Society of London, held January 6, 1890, the first Lettsonian Lecture was delivered by MR. EDMUND OWEN on "Selected Subjects in the Surgery of Infancy and Childhood" (*British Medical Journal*, January 11, 1890).

Beginning with the treatment of enlarged glands of the neck, the lecturer remarked that the presence of branching scars implied a blame either of the parents for not seeking advice in good time, or of the medical attendant for not availing himself of the means at his disposal to effect a cure without waiting for suppuration and consequent loss of tissue. He urged that instead of painting the skin over the glands with iodine or iodide of lead, the duty of the surgeon was to remove the enlarged glands without loss of time, and before the patient had been exposed to the risk of the adjacent glands becoming enlarged, and the organism exposed to the dangers of septic absorption. He then took up the question of causation, and pointed to the pharynx and tonsils as being likely sites for the entrance of septic poisons into the system. After alluding to the advantages attending constitutional treatment, change of air, etc., in enlargement of the glands, for which no exciting cause could be made out, the lecturer cautioned his listeners that perfect success could not be guaranteed in every case, or even in most cases, as the result of a first and single operation, but he claimed, however, that the effect of removal of as much as possible of the diseased tissue was always attended with marked benefit to the patient's general health and a period of arrest, if nothing more, in the further progress of the malady. He then proceeded to describe the *technique* of the operation: He makes an incision along the anterior border of the sterno-mastoid, over the tumor, of sufficient size to allow of the necessary manipulations, extending through the skin and down to the deep fascia, completing the laying bare of the glands by means of a steel director and forceps. Vessels are torn through with the forceps so as to prevent unnecessary hemorrhage until the only connections of the gland are the lymphatic vessels above and below. The enlarged glands are then removed without difficulty, the cavity which remains being washed out with a mercurial solution and dried, the edges being brought together by means of sterilized horse-hair sutures and a small drainage-tube inserted. To prevent any scars as the result of the sutures these are removed not later than the second or third day. A strip of moist protective is placed over the wound, surmounted by a pad of cotton wool, and the patient is placed in bed, the head and neck being steadied with sand-bags and perfect immobility maintained. The next day the dressing is removed, and the drainage-tube, and possibly the sutures, removed, the edges being approximated by strips of waterproof strapping. The child is kept recumbent as long as possible, and when allowed to get up, the neck is kept at rest by means of a stock of stiff buckram covered with linen. If, on making the incision, a suppurating cavity is found, the lecturer advocated laying the cavity well open, cleaning it out thoroughly, and making due provision for drainage. In a few cases it has been found necessary to divide the attachment of the sterno-mastoid muscle in order effectually to deal with the enlargements beneath it. He insisted upon the fact that the progress effected in the surgical treatment of enlarged glands in this situation was mainly due to Mr. Pridgin Teale. The lecturer narrated a case in which he had operated on a child for a sarcomatous gland of the neck, and pointed out that although in certain cases no treat-

ment short of extensive operation could possibly prove of avail, and though the shock attending such an operation might be sufficient of itself to determine a fatal result, yet, as the alternative was inevitable death, he urged that the most serious risk should be unhesitatingly accepted, and the operation undertaken. The lecturer passed on to discuss congenital cystic hygromata. He was of opinion that they were best left alone, or, at the most, tapped, as they rarely caused serious symptoms, and proved very troublesome things to deal with if operated upon. He mentioned that although he had seen dozens of these dilated lymph spaces in infants and children, he had never met with them past the age of puberty. He inferred, therefore, that absorption invariably took place, preceded or not by inflammation. He showed drawings and photographs of several cases of this kind illustrating their principal clinical features. He pointed out that the tumor of hygroma was altogether different from "hydrocele of the neck," due to non-closure of one of the branchial clefts, with subsequent distention of the cavity. Thus created, it differed in having a definite rounded contour, and in consisting of a single cyst, which on evacuation left the neck its normal shape. Such tumors were, he said, easily cured by incision and drainage. He concluded by alluding to the experimental researches of Horsley and others bearing on the effects of the removal of the thyroid gland in connection with cases of sporadic cretinism, and urged that in these days of restless, active, and aggressive surgery, control experiments upon living animals were not only justifiable but necessary.

DIURETIC PROPERTIES OF SUGARS.

In the *Bulletin Général de Thérapeutique* for January 15, 1890, Dr. S. Meilach publishes an elaborate experimental essay, made under the direction of Professor Dujardin-Beaumetz, as to the diuretic properties possessed by different sugars. The author concludes that both lactose and glucose are active diuretics belonging to the group of direct renal diuretics, for when the substances are injected into the veins of animals there is no increase of blood-pressure, or in administering to man there is no corresponding modification in the pulse. Further, it is claimed that diuresis may be produced without either the lactose or the glucose passing into the urine. They are destroyed in the organism, and, therefore, in addition to possessing diuretic properties, and thus acting as a medicament, they are to be regarded as foods. Neither form of sugar produces any nervous disturbance, and to this extent is preferable to caffeine. Further, Dr. Meilach claims that the diuresis resulting from these substances is greater than the amount of liquid drank, therefore that they produce a dehydration of the blood, and to that extent render it more apt of resorption. The author has found that the diuresis reaches its maximum in dropsies of cardiac, or even of cardio-vascular origin, when the urine is free from albumen. When the urine is albuminous, diuresis is produced, but not to so marked a degree as when albumen is absent. Lactose, in doses of a little over 3 ounces, dissolved in two quarts of water, produced marked diuresis, while 6 ounces of a seventy-five per cent. syrup of glucose will produce the maximum effect.

The author believes that the efficacy of the grape-cure is largely attributable to the diuretic effects of the glucose contained in the grape.

In *Les Nouveaux Remèdes* for January 8, 1890, reference is made to a case reported by Zavadsky, which fully confirms the researches made originally by Sée and Dujardin-Beaumetz, and extended still further by Meilach, as to the diuretic properties of lactose. The case was that of a man, with fatty heart, with arterial sclerosis and ascites. Digitalis had produced but slight result, while lactose, in doses of from 3 drachms to 4½ drachms daily, produced threefold increase in the quantity of urine secreted in twenty-four hours. The author especially calls attention to the diuretic action of milk-sugar, in doses of only one-fifth of the dose recommended by French observers, and, contrary to the assertions of Sée, calls attention to the fact that the simultaneous administration of milk or soup, or other liquid foods, does not interfere with the diuretic action of lactose. He even believes it is attributable to the milk, which contains a large quantity of milk-sugar, that he has obtained such marked results with such small doses of sugar.

THE SURGICAL TREATMENT OF HEPATIC ABSCESS.

In several recent numbers of the *British Medical Journal* M. Rickman J. Goolee has published several lectures on the "Surgical Aspect of Hepatic Abscess," the treatment of which he summarizes as follows (*British Medical Journal*, January 25, 1890):

1. Pyæmic abscesses do not call for surgi-

cal interference, or, if in rare cases one should point, it is only opened to relieve symptoms, but without hope of doing permanent good.

2. The same observations apply to abscesses resulting from suppurative phlebitis of the portal vein.

3. Multiple abscesses associated with dysentery or ulceration of the bowels are very unfavorable for surgical treatment. They must, however, be opened and treated on the same lines as the single or tropical abscess, because they cannot be certainly diagnosticated.

4. Single abscess of the liver, whether trophical or not, must, if it approach the surface, be opened, the following precautions being adopted :

(*a*) If it present at the epigastrium, the presence of adhesions must be ascertained before incising the liver.

(*b*) If through the chest wall, a spot must be chosen below the normal limit of the pleura ; but, if by chance either pleura or peritoneum be opened, the opening must be closed with a double row of stitches before incising the liver.

(*c*) Strict antiseptic precautions must be throughout adopted, either carbolic acid or some slightly soluble salt of mercury being employed for the dressings.

(*d*) The tube must be of large size at first, and a tube of some sort must be kept in until the discharge is reduced to a very minute quantity.

If the abscess have burst into the lung, pleura, pericardium, peritoneum, or kidney, and the position of the abscess can be clearly determined, it must be opened without delay. If the position of an abscess be only suspected and the patient be losing ground, it is right to puncture the liver in the most likely situations, bearing in mind that, though usually quite harmless, a slight amount of risk accompanies this very trivial operation. This rule applies to cases in which the abscess has ruptured into any of the cavities enumerated above. If, on the other hand, whether the abscess have ruptured or not, there are no means of diagnosticating the whereabouts of the matter, and the patient be not losing or even gaining ground, the surgeon should hold his hand for a time.

5. Hydatids of the upper and back part of the liver are to be treated upon the same lines ; but in cases of this sort, and in those of sub-diaphragmatic abscess, it must be remembered that the diaphragm may be pushed up to a very great height, thus closely simulating intrapleural suppuration.

6. Empyema, pericarditis, and peritonitis caused by rupture of an hepatic abscess or hydatid must be promptly dealt with on general principles.

COCAINE IN YELLOW FEVER.

Dr. James Thorington states in the *American Journal of the Medical Sciences* for January, 1890, that in an experience of seven years' active practice on the Isthmus of Panama, where cases of yellow fever were constantly under his observation, he has tried many kinds of treatment in yellow fever, such as—

Quinine, which he found did much more harm than good, except during convalescence.

Calomel, which did good only at the beginning of an attack, and much injury if used later.

Castor oil and orange-tea, as recommended by the physicians in Cuba, did good in some instances.

The pure juice of the lime, with small pieces of cracked ice, as recommended by physicians in the service of the Panama Canal Company, was found more satisfactory than any of the above methods of treatment.

The author tried also veratrum viride faithfully in several cases, but without success. In many of the cases Dr. Thorington found that good nursing, without medicinal treatment, saved the patients.

Dr. Thorington noted that in the majority of cases death was attributable to nausea and vomiting and not to suppression of the urine, and he concluded that if he could find some means of quieting this nausea the possibilities of recovery would be greatly increased. Cocaine, as an antiemetic, was suggested to him by Dr. Jennings, and he states that he has tried it in every case since, the results being most gratifying. Before he commenced using cocaine, he writes that he lost fifty per cent. of his yellow fever cases ; but since then, he states, that he has treated twenty cases, and has had but three deaths, these three patients dying from suppression of urine. Dr. Thorington claims that when cocaine is used in the treatment of yellow fever, black vomit or vomiting is never a part of the disease, and suppression of urine is then the only symptom which need cause anxiety ; and even here he states that he has in some

cases seen cocaine act as a diuretic. Before using cocaine he states that black vomit occurred in nearly all his cases, but now it never appears after the drug has been used, and rarely does it fail to check the vomiting and put the stomach at rest. To avoid vomiting, when the drug is administered, the author writes, he has noticed that it is better to give it in a solution on an empty stomach, as when administered immediately after taking nourishment it is apt to go beyond the stomach, or even be rejected if the patient vomits. This result is also very apt to happen if the cocaine is given in pill or tablet. Whenever the patient feels nausea returning, a dose of cocaine should be immediately given, even if a preceding dose had been given fifteen minutes before. Dr. Thorington has found it necessary to give as high as ½ to ⅔, or even 1, grain, every half hour, if the vomiting is not checked after the first or second dose of 10 minims of a four per cent. solution.

In summing up the value of cocaine in the treatment of yellow fever, the author states it to be almost a specific, in his experience doing more to cure yellow fever than any other drug he has ever tried, taking away or removing all nausea and vomiting, acting as a diuretic, and as an excellent and sure "heart-tonic and stimulant."

THE TREATMENT OF ERYSIPELAS BY SUBCUTANEOUS INJECTIONS OF CARBOLIC ACID.

In the *Bulletin Général de Thérapeutique* for January 15, 1890, reference is made to ten cases of erysipelas treated by Dr. P. Samter with subcutaneous injections of carbolic acid. The results of this treatment were in the author's cases so marked that he states that he believes he is warranted in positively stating that all forms of erysipelas may certainly be arrested by means of these subcutaneous injections. That the success, however, be complete, two conditions are indispensable. In the first place, the diagnosis must be positive; in the second place, it is necessary that the doses of carbolic acid injected should be sufficient. He even claims that when there is a swelling which possesses the appearance of erysipelas, which is not influenced by injections of carbolic acid, it may be positively concluded that the case is not one of true erysipelas. The author further claims that, in cases where the injections of carbolic acid are practised early, the erysipelas will be but rarely accompanied by the development of abscess or other complications. The solution which the author employed consists of 39 parts each of pure acid and absolute alcohol dissolved in 94 parts of distilled water. The injections are commenced in a healthy section, about half an inch from the border of the patch of erysipelas. The needle of the syringe is inserted obliquely, without lifting the skin, towards the affected part, and inserted just sufficiently deep that the injection penetrate the deeper layers of the skin. An entire syringeful should be injected slowly while making lateral movements of the needle. When the erysipelas is not located on the face, the pain occasioned by this injection is reduced to a slight sensation of burning. The different points of injection should be separated by spaces of about an inch or more, according to the quantity of carbolic acid injected at each point. In some instances he has injected at one sitting as much as 4 to 7 grains of pure carbolic acid. In order to avoid all danger of poisoning, the author recommends from the commencement of this treatment the administration of a tablespoonful of a solution containing 3 parts of the sulphate of sodium to 100. Ordinarily, he finds that the temperature is reduced to normal within twelve or twenty-four hours. When the erysipelas is located on the trunk, the injections of carbolic acid may generally be repeated several times, though it is only in the earliest stages of the disease that 150 to 225 minims will be sufficient to arrest the development of the morbid process. If the erysipelas extends over a wide surface, it is only possible to perform the injections on one edge of the diseased surface at a time, and then gradually to extend the line of injections, so that each series shall be separated by twelve or twenty-four hours. In cases of erysipelas of the face or of the scalp, this mode of treatment offers greater difficulties, as in these localities the subcutaneous injections are more painful, and besides are much more liable to lead to the development of more or less extensive abscesses. Nevertheless, in spite of the disadvantages of these conditions, the author states that he would not hesitate to employ injections of carbolic acid in erysipelas of the face or scalp when the disease becomes at all alarming.

OXYTOCIC ACTION OF QUININE.

The power possessed by quinine of exciting uterine contraction has been generally admitted, but authors differ widely as to the extent to which it possesses this property. Some claim that its abortifacient action is exerted only during the early months of pregnancy, others only towards its close. It has been asserted to exert a selective action upon the fibres of the body of the uterus, to the exclusion of the cervix, while others claim that it is most active in promoting dilatation.

On the other hand, the number and creditability of the authors who deny absolutely that quinine has any property of stimulating uterine muscular fibres quite equals those who maintain the contrary. Some experiments reported by Dr. I. E. Atkinson in the *American Journal of the American Sciences* for January, 1890, throw some light upon this vexed question. Dr. Atkinson refers to two experiments made by Rancillia on pregnant dogs, in which the administration of quinine produced delivery, and one made by Magnin in which quinine produced abortion in a pregnant rabbit. Though it must be confessed that other experimenters have failed to produce abortion through the administration of quinine, and, in fact, in some cases have administered enough "to produce death without disturbing the products of conception." Dr. Atkinson has collated twelve cases, published by various authors, in which the administration of quinine led to the production of uterine contractions, and one case, occurring under his own experience, in which quinine was administered in 5-grain doses every four hours to a woman in the eighth month of her first pregnancy, who was attacked with quotidian intermittent fever. On the first day the remedy was given too late to interfere with the chill, which occurred on the second day; during this day twenty-five grains of quinine were administered again, and on the subsequent day there was no paroxysm, but on that day the patient stated that she had been feeling transient pains in her back since the early morning, these increased during the evening and night, and on the next day she was delivered of a live child, which seemed considerably smaller than an infant born at term.

No reliable conclusion can, however, be drawn from these cases reported, for the action of the remedy is liable to be confounded with that of the disease upon the organism; but there is no difficulty in determining that the action of quinine upon the uterus, even if it exist, is inconstant. Quite a number of writers have shown that quinine not unfrequently prevents abortion by its power of counteracting abortifacient morbid action. It is significant that many of those who deny that quinine ever acts as an oxytocic, freely admit that malaria itself may provoke uterine contractions and interrupt pregnancy. It is extremely improbable that any malarial patients escape the ingestion of quinine, unless by accident, and it is thus that a certain number of the cases supposed to illustrate the abortifacient tendencies of malarial intoxication may, in fact, present examples of idiosyncratic reaction to the presence of quinine in the system. The latter possibility, supported by the observations of the large number of writers already quoted, certainly justifies the demand for renewed attention to the subject.

In conclusion, the following propositions are submitted by the author:

1. The cinchona preparations have not a fixed and definite influence in causing contractions of the uterus.

2. An oxytocic action is occasionally produced by these remedies. This action depends upon idiosyncrasy; and, as in the other idiosyncratic reactions to cinchona, it is impossible to foretell, in any given subject, its manifestation.

3. There is some evidence that this action is only exerted under large doses or in debilitated subjects.

4. Cinchona and its derivatives should be employed during pregnancy with great circumspection, and should be at once withheld upon the supervention of symptoms indicating a uterine-motor influence.

THE SYMPTOMS AND CONDITIONS WHICH JUSTIFY NEPHRO-LITHOTOMY.

At the Newport meeting of the South Wales Branch of the British Medical Association, Mr. W. H. A. Jacobson read a long paper as to the symptoms and conditions which justify nephro-lithotomy, the chief condition simulating renal calculus, and some practical points in the operation of nephro-lithotomy (*British Medical Journal*, January 18, 1890).

He first calls attention to the following symptoms and conditions which justify nephro-lithotomy. These are: 1, continued hæmaturia, or passage of blood and pus; 2,

pain or tenderness in the loin or elsewhere; 3, points connected with the previous history, for example, family history, habitat, habits, lithiasis, oxaluria, passage of previous stones, renal colic; 4, frequency of micturition; 5, absence of any condition in the rest of the urino-genital tract to explain the symptoms; 6, failure of previous treatment.

As regards the conditions which simulate renal calculus, Mr. Jacobson qualifies them as follows. These are: 1, lithiasis, and, to a less degree, oxaluria; 2, tubercular kidney; 3, pyelitis, not tubercular; 4, movable and (5) aching kidney, especially if associated with (6) neuralgic conditions; 7, disease in organs contiguous to the kidney; 8, disease of lumbar spine; 9, interstitial shrinking nephritis; 10, malignant disease of the kidney, especially of its pelvis and malignant disease around last dorsal nerve.

Finally, the author alludes to the following points, which deserve particular attention in the performance of nephro-líthotomy:

1. To count the ribs. That this is not an unimportant detail is proved by the fact that PROFESSOR DUMREICHER, of Vienna, accidentally opened the pleural cavity in an attempt to remove a pyelo-nephrotic calculus kidney. Post-mortem: the last rib was found to be rudimentary, and the pleura projected a good deal below the lower edge of the eleventh rib.

2. To make a sufficiently free incision, especially in a stout patient, and a deep loin. Additional room may be gained by converting the usual lumbar incision into a T-shaped one, or by making use of Konig's incision, in which the muscles are cut through as far as the recuts, and the peritoneum pushed forward. A small stone in a kidney will always be liable to be overlooked, but a surgeon does not give his patient or himself a fair chance who is content with exposing the kidney through a limited incision, and then trusting to punctures with a needle.

3. To pack away with sponges the colon, which is often troublesomely distended with flatus in these cases.

4. If the stone cannot be felt either in the pelvis or after palpation of the posterior and anterior surfaces of the kidney, this should be drawn up and out of the wound as far as possible, and again examined, a careful watch being kept upon the pulse.

5. In puncturing the kidney, to try, as far as possible, to open the calyces systematically.

6. If palpation and acupuncture fail to find a stone, the kidney should be carefully opened and sounded.

7. Hemorrhage from an incision into the kidney is certainly arrested by firm, careful plugging with strips of sal alembroth gauze. It is said that this plugging may cause vomiting. This did not occur in any of my cases. It ceases on the removal of the plugs. Care must be taken that the plugging is thoroughly done. If inadequate, it will have to be repeated in a few hours,—perhaps more than once,—thus leading to exhaustion and setting up cellulitis, which may of itself be fatal, owing to the important relations of the kidney.

8. Sources of difficulty in removing the stone. The chief of these are: (1) A very mobile kidney, which gets away deep in the wound; (2) a stone situated on the anterior surface and near the entrance of the vessels; (3) a small stone in a sacculated kidney, the stone falling into one of the sacculi, and thus being hard to find.

9. Multiple calculus in a suppurating, damaged kidney. If the question of nephrectomy arise, this step should, as a rule, be deferred, and the kidney thoroughly drained, for (1) additional shock and loss of blood will be avoided. (2) The condition of the opposite kidney, very possibly calculus also, will be made clearer by waiting. (3) The bulk of the kidney will be lessened by drainage. (4) Though a source of discomfort (if an open sinus persist) it may still do some and important work.

10. If the kidney has been much disturbed it should be stitched *in situ*.

THE TREATMENT OF EPILEPSY.

In the *Journal de Médecine de Paris* for January 12, 1890, M. CORNET publishes the results of his experiments, made under the direction of M. Bourneville, as to the use of bromide of gold, bromide of camphor, and picrotoxine in the treatment of epilepsy. The bromide of gold appeared to have a certain favorable influence in certain epileptics, although this action was inferior to that of the bromide of potassium. No unfavorable result was, however, produced through the employment of ½ grain daily. The bromine of the bromide of gold is eliminated by the urine, where it is found a very short time after its ingestion, and disappears but slowly, the bromine appearing a short time after its ingestion and disappearing slowly, whereas the gold accumulates in the liver,

and only appears in the urine a long time after the commencement of the treatment. The bromide of camphor, whose action upon cataleptics is still disputed, according to this author, has a favorable action upon the attacks of vertigo in epileptics, the attacks diminishing in severity, and even leading to their entire disappearance. The bromide of camphor is also eliminated by the urine, the bromine in the state of bromide of sodium and the camphor in the form of derived products, resulting from its transformation in the organism. Picrotoxine produces, according to the author, a favorable influence upon attacks of epilepsy, when administered in doses of $\frac{1}{40}$ to $\frac{1}{32}$ of a grain.

THE ACTION OF SOLANIN AND SOLANIDIN.

Solanin is a basic glucoside which, under the action of dilute acids, splits up into solanidin and sugar. Since the identity of solanin from the various solanaceæ has not yet been positively determined, MAX PERLES, in an elaborate study to determine the action of solanin, employed solanin obtained from the potato. In its action upon lower organisms, such as amœba and infusoria, as well as ciliated epithelium, solanin proves itself to be an intense protoplasmic poison. The development of bacteria is prevented by solanin, in the concentration of less than one per cent. Mixed with blood, in small amounts, solanin accelerates coagulation of the blood, while in larger amounts, on the other hand, it prevents coagulation and produces decomposition of the blood. Defibrinated blood becomes lake-colored through the action of solanin, while the red blood-corpuscles are partly dissolved. The concentration necessary to produce this effect is very slight, 1 to 100 sufficing. When in contact for several hours with the blood, oxyhæmoglobin is converted into reduced hæmoglobin, but not into methæmoglobin. On cold-blooded animals solanin produces a distinct paralysis of the nervous system, progressing from the brain to the spinal cord, which leads finally to paralysis of the heart. In experiments made directly on the heart, the author found that the power of the heart-muscle was immediately reduced through the influence of solanin, while the pulse volume and pulse frequency were only gradually affected (*Centralblatt für Klinische Medizin*, No. 2, 1890). The toxic action of solanin on the heart is attributable to the solanin itself, and not to any secondary effect produced through action on the blood-corpuscles. In experiments in which serum was substituted for blood, in order to ascertain the action upon the heart, the results were still the same. Microscopic examination of the heart-muscle after the action of solanin showed that it was largely deprived of its transverse striation, while the primitive bundles were disintegrated and unelastic. Locally applied, solanin produces tissue destruction, so serving to explain the cause of the apparent anæsthesia produced. In direct application to nerve-trunks, the nerve is first irritated and then paralyzed, while the muscles, on the other hand, are directly paralyzed without any antecedent stage of irritation and lose their transverse striation. In warm-blooded animals, after careful, slow injection of solanin solutions directly into the blood, there is first violent tremor, and later clonic convulsions of the jaw, neck, and back-muscle, which may also be reflexly produced during the pauses of the convulsions. These symptoms of irritation are very rapidly followed by an increasing central paralysis, affecting especially the respiratory centre, while the peripheral nerves and muscles remain irritable up to death.

One of the characteristic symptoms of poisoning with solanin consists in the variation of temperature, and the thermometer enables us to form quite as accurate conclusions as to the degree and stage of poisoning as is the case in a fever. So even in non-fatal cases the lowest point in the temperature curve corresponds to the highest degree of the intensity of the poisoning, and recovery progresses uniformly with the increase of the temperature. Respiration is seriously interfered with and becomes highly dyspnœic, these symptoms partly being attributable to disturbance of the circulation and alterations in the blood. The digestive organs do not escape the action of solanin; vomiting is produced in dogs by the excretion of solanin into the stomach, and is apparently reflex. At the post-mortem examination, enteritis will nearly always be found, with isolated hemorrhages in different parts of the intestinal wall, similar to what may occur in typhoid fever. The kidneys are the seat of acute nephritis; infarcts are to be found in the renal tubules, thus leading to albuminuria and the appearance of tube-casts in the urine. Alterations in the organs of circulation, as evidenced in the decrease of irritability of the vaso-motor centre and of the power of the heart, only

occur shortly before death. Injections of solanin into the peritoneal cavity, through the violent irritation of the peritoneum, produce severe shock, from which the animal only recovers partially in half an hour at least. Autopsy will reveal hemorrhagic and exudative peritonitis. In subcutaneous injections the action of solanin upon the kidneys and intestine is almost invariably wanting, while the alteration of the blood is only present in a slight degree. In cases of fatal poisoning, with solanin administered subcutaneously, the principle symptoms are progressive, general paralysis, reduction of the temperature to 88.7° F., dyspnœa, and heart paralysis. The fatal dose, when administered by the stomach, amounts to 5 grains for every two pounds of body weight, death being produced in twelve hours. In smaller doses marked symptoms of poisoning are rarely met with. In dogs, when administered by the stomach, the emetic effect is the most marked, and, as a rule, prevents its being absorbed. If, however, it is absorbed, or if it is permitted to act directly upon the intestinal tube, violent acute inflammation of the mucous membrane and of the intestinal tube is produced, and profuse diarrhœa results.

Solanidin, which results from the action of acids upon the solanin, is also a blood-poison; central descending paralysis especially affecting the respiratory centre, then the ganglia of the heart and the heart-muscle, are the principal results which follow the subcutaneous injection of solanidin in cold-blooded animals, the only difference from the action of solanin being found in the fact that the paralysis develops somewhat slower. The local irritant effects of solanin are not exerted by solanidin, while solanidin, further, has but little action on the peripheral nerves and muscles. In warm-blooded animals a constant fall of temperature up to death is an invariable symptom in fatal poisoning with solanidin as with solanin. The nephritis is likewise provoked by solanidin, as is also the inflammation of the intestine. The principal difference between solanin and solanidin is found in the fact that the latter injected into the peritoneal cavity, or into the subcutaneous cellular tissue, or into wounds, produces no local symptoms of irritation. The above attributes of solanin and solanidin warrant their location in the group of the sapotoxines, such as quillaiaic acid, sapotoxine, senegin, cyclamin, etc.

Reviews.

A Contribution to the Surgery of the Spinal Cord. By William Thorburn, B.S., B.Sc., M.D. (Lond.). With diagrams, illustrations, and tables. Philadelphia: Blakiston, Son & Co., 1012 Walnut Street.

In looking over this book the first thing that attracts the attention of the reviewer is the extraordinary frequency of injuries of the vertebral column in the service of the Manchester Infirmary. The two first lines of the book state that in four years twenty-one cases of injuries of the cervical spinal cord alone have been admitted to the institution. This remarkable opportunity has been well availed of by Dr. Thorburn, the result being a very valuable contribution to practical neurology.

The volume opens with a discussion of the distribution of the cervical nerves, chiefly founded upon the careful examinations of twenty-one cases. The conclusion differs very materially from that by Gowers in his "Diseases of the Nervous System," and also from the tables of Herringham. The diversity suggests that variety in the distribution of the cervical nerves is common, but further observations can alone settle this question.

The body of the work is divided into eight chapters, and, in order to give our readers as clear an idea as possible of the scope, we state the subjects of its chapters: 1, "Injuries to the Cervical Region of the Spinal Cord;" 2, "Injuries to the Cervical Region of the Spinal Cord" (continued); 3, "Injuries to the Dorsal Region of the Spinal Cord;" 4, "Injuries to the Cauda Equina;" 5, "Injuries to the Lumbo-Sacral Region of the Spinal Cord;" 6, "The Indications for Operative Treatment in Affections of the Spinal Cord;" 7, "Ophthalmoscopic Changes in Injuries of the Spinal Cord and in Traumatic Neuroses;" 8, "Traumatic Hysteria, especially in Relation to Railway Accidents."

In regard to operations upon the spinal cord, Dr. Thorburn very properly calls the attention to the fact that if the cord is ever severed by an injury, the result is not a clean cut of its structure, but a crush, and that it is hopeless to expect that a crushed cord can recover itself. His experience has led him to conclude that the operation of trephining the spine for traumatic lesions, as compared with the condition which it is intended to relieve, does not present any very great dangers, and appears unlikely to increase the gravity of the prognosis, but that as both *a priori* argument and the results of published cases show that

it is unlikely to be of service, it should be abandoned, except in cases of injury to the cauda equina, and that in the latter, on the other hand, it will probably prove to be an eminently justifiable and serviceable procedure.

One of the most interesting chapters in the book is that on traumatic hysteria,—a chapter which is practically a discussion of the results produced by railroad accidents and other similar catastrophes. In discussing this subject, it seems to us, that Dr. Thorburn is not always as clear as in other portions of the book. The term "concussion of the spine" is certainly very frequently misused by authors, but we have no doubt but that there is concussion of the spine, and that it is an essentially different state from traumatic hysteria, neurasthenia, meningitis, myelitis, or any other recognized affection. Dr. Thorburn says that the classical concussion of the brain is a well-understood affection, representing almost certainly a definite organic pathology,—viz., intracerebral hemorrhages. We do not believe that intracerebral hemorrhage occurs in ordinary concussions of the brain; it seems to us absurd to suppose that an unconsciousness which lasts for perhaps five minutes, perhaps five or ten hours, and which is recovered from at once without the remnant of any mental or physical disorder, depends upon so serious a lesion as intracerebral hemorrhage. The pathology of brain concussion is simply suspension of brain action by shock, and, if the cells recover their functional activity, they go on in their usual course, unless there has been some intracerebral hemorrhage or other organic change. Blows upon the spine will sometimes momentarily arrest the functions of the cord, recovery occurring precisely as when the function of the brain has been arrested by violence. The term "concussion of the cord" should be restricted to such cases. Any case of disordered innervation following violence, in which the symptoms have continued till long after the first shock, or perhaps have not at first appeared at all, is not one of simple concussion of the spinal cord. It is, perhaps, the frequent misuse of the name by its application to chronic states which has led Dr. Thorburn into denying the existence of concussion of the cord.

The post-traumatic functional neuroses Dr. Thorburn has arranged as follows:

1. Acute effects.

a. General nervous depression,—"shock" or "collapse."

b. A more localized and defined disturbance of cerebral (cortical) origin,—"chronic hysteria."

This classification is correct, as far as it goes, but does not include the very common cases, in which not merely functional but absolute organic change occurs. Traumatic myelitis and traumatic meninges myelitis exist as well as the traumatic functional neuroses; often, indeed, the great practical difficulty in these cases is to decide whether the symptoms are dependent upon organic change or not.

Acute hysteria developed from railway or similar accidents offers nothing etiologically remarkable. The fright of such an occurrence is sufficient to upset any but the most stable nervous system. The existence of traumatic hysteria is, perhaps, not so universally recognized, but, as Charcot long ago insisted, the affection is not extraordinarily rare, and is often severe and difficult of treatment.

Space is wanting to follow our author further in his discussion of the various questions connected with surgery of the spinal cord, and we must conclude our notice by recommending very strongly to our readers this book as an excellent, clear, concise monograph, having for its underlying foundation a thorough-going knowledge of the subject, as quarried out by the author from his own experience and from the records of other writers.

A Text-Book of Mental Diseases, with Special Reference to the Pathological Aspects of Insanity. By W. Bevan Lewis, L.R.C.P.
Philadelphia: P. Blakiston, Son & Co., 1890.

The volume which has been given by Dr. Lewis to the profession is essentially different in its arrangement and scope from any of the treatises in the English language with which we are familiar; indeed, its individuality is so marked as to isolate it among the books of all tongues. It is divided into three great sections, or, as the author terms them, parts. The first is the anatomical and histological section, comprising one hundred and fourteen pages; the second, the clinical section, of about three hundred pages; the third, the pathological section, of one hundred and eighteen pages.

The opinion which a reviewer will arrive at concerning the volume will depend upon the point of view from which he looks at it. The title-page of the work calls it "text-book;" the preface, "a new treatise." As a text-book, we cannot think the work is a success;

as "a new treatise," to be carefully read, and, as far as possible, understood and digested by one who knows already more or less concerning insanity, the work is of value.

We have often before expressed a disapprobation of clinical text-books in which a large proportion of the pages are occupied with something else than clinical medicine. The student should get his anatomy from an anatomical text-book, his clinical medicine from a clinical text-book, and should not be allowed to use a clinical text-book until he has worked up his anatomy. The first part of the work of Dr. Lewis is a valuable *résumé* of the latest studies of the anatomy of the nervous system, and has much, in the microscopical portion of it, that is distinctly fresh, and gives evidence of continuous practical work with the microscope. These chapters, we may say, are excellent for the practitioner who wishes to refresh his memory.

In the clinical part of the work Dr. Lewis seems to be distinctly in advance of most alienists, in that he considers the various so-called insanities not as diseases, but as symptoms or symptom groups to be studied with the hope that some time we may understand their relation with pathological states. As he is very metaphysical, or, perhaps, we had better say, psychological, in his methods of study of the various mental states, and as there is nothing very recent upon medical psychology in the English language available to the ordinary student, it would have been much better if the anatomical portion of the book had been replaced by chapters of physiological psychology. Certainly such chapters would have made much more easy the understanding of the clinical text. We opine that the medical student, or, at least, the average of even the best class of American medical students, will rend his clothes, and bedeck himself in sackcloth and ashes, refusing to be comforted, if required to be examined upon a book which commences its clinical studies by stating, "simple pathological depression is ushered in by that *failure in object-consciousness* which invariably inaugurates a corresponding *rise in subject-consciousness;* and which, we have reason to infer, implies a diminished functional activity in those realms of the cerebrum correlated thereto;" and continues by affirming, "the ego may exist as a *double personality*, each independent of the other, or the one swayed by the other, and utterly dissentient in their nature. We need not here deal with these minor differences, but rather consider the development of the latter class, where the identity is transformed and the non-ego is estimated in terms of the malign." We have read some psychology, and have even ventured to dip our pen in psychological ink, but what is meant by the "non-ego being estimated in terms of the malign" we can only guess, and for fear that after our jump we might not alight upon our feet, we will refrain from exercising the Yankee's privilege.

The psychological method of the study of insanity involves hard thinking, and, almost of necessity, some obscurity, because it involves penetration into a cloud-land of doubt and uncertainty. Some of the difficulties of the book for the reader are, therefore, inseparably adherent to the method, but more careful writing, and especially more careful use of prepositions and adjectives, would improve the text. As an instance we quote the following paragraph:

"We frequently observe, both in epilepsy and general paralysis, instances of suddenly-assumed stupor, both of long continuance and not necessarily preceded by any obvious motor discharge or convulsion. Undoubtedly, in these cases, there has been discharge *of unstable gray matter from sensorial realms of the cortex*" (the italics are our own).

A discharge of unstable gray matter from sensorial realms would soon lay waste such realms of the cortex, and certainly would require an opening in the skull or some other channel, through which the gray matter could escape. We suppose our author means discharge *by* unstable gray matter *in* the sensorial realms.

Dr. Lewis certainly should remember that the great object of all style is to make the writing so clear that no conscious effort shall be required of the reader. Labor by the author must save the labor by the reader, and the author in the present days of literary competition, who will not do the labor, can scarcely expect to reap the reward of being widely read.

In conclusion, we desire to reiterate our belief that the treatise written by Dr. Lewis is thoughtful and suggestive, challenging the attention of all of the higher class of alienists. Of course we do not agree with all of his statements or views, but although much is difficult to understand, and possibly scarcely to be understood by the ordinary doctor, we know of no recent work in the language upon the subject which is more instructive and more worthy of attention, provided it be taken in not too large doses at one time

Correspondence.

PARIS.

(From our Special Correspondent.)

Influenza, Statistics and Contagiousness—Official Antiseptics for Midwives—Persistent Virulence of Consumptive Sputa—Better Pay for Expert Work—Poisoning by Crystallized Aconitine; Proper Dose of the Alkaloid—Business Value of Drunkards.

Now that the influenza is over, as is shown by Dr. Bertillon's official statistics, it is time to count up the dead. The epidemic is estimated to have caused here about five thousand deaths, or nearly as many as usually occur during five weeks of the season, and the plague did not last much longer. Such a death-rate is certainly very high. On the other hand, the rate is now running below the average, which our statistician doctor thinks is owing to the fact that the disease, having hastened the exit of a number of weak persons, many died then who would otherwise be dropping off now and for some time to come. But if the epidemic is over, scientific memoirs on it, and especially microscopic discoveries, are coming in thick and fast. Microbes, bacilli, micrococci, pneumococci, diplococci, streptococci, and even hæmatozoa of the influenza are disclosed every day by scientists at home as well as in England, Germany, Italy, and other parts of Europe. America, being the last to catch the disease, has not been heard of yet, but no doubt soon will be. It never rains but it pours. To part the wheat from the chaff is at present no easy matter, and, without intending any disrespect to the learned investigators, perhaps it is wisest, amid such confusion, to wait until things have taken a clearer shape. And among the copious literature of influenza only one fact, or rather incident, will be mentioned here, because it is one to be rarely observed. According to the official report of Dr. d'Hoste, of the transatlantic steamer "Saint-Germain," the ship sailed on December 2, 1889, from St. Nazaire for Vera Cruz. All on board were well, influenza not having yet reached that part of France. On December 5 the steamer called at Santander for passengers, and there received, among others, a man coming from Madrid, where the epidemic was raging. The passenger, who was well when admitted, fell sick the next day, and soon the contagion spread on board, Dr. d'Hoste being the first to be influenzed. Out of four hundred and thirty-six passengers, one hundred and fifty-four were sick, with forty-seven of the crew and officers besides. Most of the cases were slight and a few dangerous, but no deaths resulted. From this unique observation the conclusion may clearly be drawn that influenza is a contagious disease, communicable not only through its complications and sequelæ, but by itself before any secondary effects have developed. Such was the opinion expressed before the Academy of Medicine by Dr. Proust, a professor at the Faculty.

Corrosive sublimate as an antiseptic has won a glorious victory,—that is, if official decisions have any weight in scientific matters. It occurred as follows: The absolute necessity of antisepsis in obstetrics is now a well-established fact, both in hospitals and civil practice. Unfortunately, most antiseptics are poisonous in improper doses, and the French poison law is very strict, as pharmacists know to their cost. No one wishes to repeal a law which is very beneficial in itself, since there are in France fewer poisoning cases in a year than during a week in England, where familiarity with poisons has bred contempt. But it is now found desirable to relax the law, so as to enable midwives to readily procure antiseptics which pharmacists are forbidden dispensing without a physician's prescription. Before having a presidential order issued, modifying the poison regulations, the Minister of the Interior has consulted the Academy of Medicine on the propriety of the change, and asked its advice as to the best way to effect it. The learned body at once agreed on the advisability of granting midwives more facilities. But when it came to the choice of antiseptic or antiseptics, a long debate ensued, lasting over several sittings, although the subject had been well elaborated by a committee. As regards the nature of the substance, the battle raged over the whole list of antiseptics, and the question whether one or more should be authorized; as to the preparation thereof, the fight was between solutions, powders, and tablets. Not to go over the whole ground, suffice it to say that it was decided only one antiseptic should be recommended,—namely, corrosive sublimate,—and the shape of a powder was preferred, as being more convenient than a liquid, and less dangerous than tablets, which children might take for candy. Finally, it was agreed that pharmacists should be authorized to deliver to graduated midwives, on their own written order, the following composition:

Corrosive sublimate, 25 centigrammes;
Tartaric acid, 1 gramme;
Coloring, sufficient. Mix.

For one powder. Affix an orange-yellow label bearing the following directions:

Sublimate, 25 centigrammes; for one litre of water. POISON.

To translate into more familiar weights and measures, the powder is to consist of four grains of sublimate and sixteen grains of tartaric acid, and to be dissolved in thirty-five fluidounces of water. The nature and quantity of coloring have not yet been agreed upon. The committee first proposed Bordeaux red, but this was set aside as too dangerously similar to claret wine. Another dye is to be selected at next meeting, probably an aniline blue, as has been adopted in Belgium for the same purpose. The addition of tartaric acid is intended, not only to give bulk and a distinct taste, but to insure the ready solubility of mercuric chloride. The Academy has recommended also that pharmacists be authorized to dispense to midwives vaseline, with one per mille of corrosive sublimate, in quantities of one ounce at a time.

The persistent virulence of consumptive sputa is an important fact which should always be kept in mind. Koch, and Tappeiner before him, have shown that the phthisis bacilli are not killed by the drying of the sputa. But Drs. Malassez and Vignal have carried the experiment further, to show the microbe's tenacity of life. In order to imitate closely the conditions of ordinary life, they have taken phthisic sputa, dried and powdered them, then moistened them again, and repeated several times the same series of operations, just as is likely to happen naturally to spittles dropped on the floor or the sidewalk, and found, by actual comparison, the bacilli to be almost as numerous and virulent as the first day. These observations confirm the importance, admitted by most hygienists, of guarding healthy people against the dejections of phthisics, and devising some practical means to destroy the germs effectually.

The strike of the Rodez physicians, alluded to in the February number, page 65, having been imitated by doctors in another locality, the Minister of Justice found himself compelled to take some immediate action, pending a Parliamentary determination of the matter. Physicians are justly indignant at the grotesque compensation for medical expert services allowed by fatly-salaried law officers, and, thinking these well-fed individuals could very well act more fairly on their own authority, have resolved to stand imposition no longer, and not to wait for the proverbially slow action of parliamentary bodies. This was the proper way to act and the only one to obtain justice from lawyers, who cannot possibly proceed without medical experts in many criminal cases. Consequently, Minister Thévenet has sent a circular letter to all his "procureurs généraux" (district attorneys), directing them to at once confer with the medical associations of their districts as to the proper compensation for expert work. The local associations have in their turn referred the matter to the national association, and, although the medical body rather mistrusts the legal fraternity, it is probable the difficulty will soon be satisfactorily adjusted.

A fatal poisoning accident from aconitine, which recently occurred in Antwerp, has once more forcibly called the attention of the profession to the danger resulting from the practice of selling, under the same name, so-called alkaloids, differing in strength from the pure chemicals. An Antwerp pharmacist received and dispensed the following prescription:

Crystallized aconitine, ¼ milligramme ($\frac{1}{180}$ gr.);
Sulphate of quinine, 15 centigrammes (1½ gr.).
For one pill. Send 10 such pills. Dose, 5 a day.

The patient, a lady, was taken so sick after the third dose that she would not have another. Her uncle, a man aged 60, to show her there was no danger, swallowed at once two of the pills. Soon after he was taken with convulsions, and an hour later was dead. The victims being of some standing in society, the town was greatly exercised over the sad event. Whereupon, the Antwerp Pharmaceutical Society sent a circular letter to every member of the medical and pharmaceutical professions, saying, in substance, that "the increasing use of alkaloids in therapeutics prompts us to call the attention of physicians and pharmacists to the varying strength of the substances sold under that name by various makers. According to law the pharmacist is bound to dispense the preparations officinal in the Belgian Codex, in the present case, amorphous aconitine. Of late, pharmaceutical chemistry has wonderfully progressed, and special laboratories supply some alkaloids, such as aconitine, eserine, digitaline, gelsemine, etc., in such a state of purity, and, in consequence, so active, that it is important the practitioner should be well posted as to

the comparative strength of amorphous and crystallized alkaloids. From a paper just published by Professor Plugge, of Groningen, on aconitine nitrate it appears that the nitrate prepared by M. Petit, of Paris, is at least eight times as active as that made by Merck, of Darmstadt, and one hundred and seventy times as powerful as that of Trommsdorf, of Erfurt. We know, besides, that the crystallized alkaloids prepared by Duquesnel are considerably more potent than those of German origin. Hence, to avoid mistakes and confusion, physicians are respectfully requested to clearly state in their prescriptions whether they mean the amorphous or the crystallized alkaloid, and pharmacists are cautioned against the dangerous difference in the strength of the two." To this very wise advice it may be here added that about two years ago the Paris Society of Pharmacy, of which M. Petit is a member, found it necessary to issue a similar warning. Several accidents, none fatal though, having been caused by one-fourth of a milligramme doses of aconitine, the society published a notice that *one-tenth of a milligramme* is the regular beginning dose for both crystallized aconitine and crystallized digitaline. But, to come back to the Antwerp case, the blame apparently lies on the pharmacists, because it was his duty to know that one-fourth of a milligramme is too much for a dose, and to refuse to dispense the prescription as it was, even if the physician had specified crystallized aconitine. On the other hand, the doctor may not be held quite blameless. At all events, the case must have been considered doubtful, as the crown did not prosecute. Now, to take a broader view of the question, which should physicians prescribe in preference, amorphous or crystallized chemicals? Of course, the crystallized. Their extreme potency is unimportant as long as we know the dose. The important point is that they are pure and not apt to vary like amorphous compounds. Only let all remember that the dose of crystallized aconitine and crystallized digitaline is one-tenth of a milligramme, or one-six-hundredth of a grain.

Beef extract as an article of diet is here reasonably popular, but as a temperance drink it has turned out a complete failure. Some time since a well-known English firm, which shall remain nameless, established a branch house in Paris for its extract of beef, and spent considerable money for advertising. But the other day the manager confessed they were sadly disappointed. The native competition they could stand; the exclusion of some of their preparations, as violating the pharmacy law, they did not mind; but the absence of drunkenness ruins the beef-tea business. Here every one—man, woman, and child—will take his vile claret, and never get drunk. Consequently, there are no temperance societies, as in England, with coffee palaces where they dispense hot beef-tea and other teetotallers' beverages, and thus dealers in extract of beef find themselves deprived of their best customers.

PARIS, February 19, 1890.

BERLIN.

(From an Occasional Correspondent.)

The International Congress—Virchow before a Strange Corona—The Code and its Victims—Professor Becker's Death—Bergman's Plastic Operation—A Rare Case.

The Berlin Congress Committee is hard at work. Dr. Lassar, general secretary, has asked your correspondent to make the official *honneurs* to the American and English guests. I was also asked to name the most distinguished gentlemen of the American profession, as special honors are to be conferred upon them. I understand that it is likely that his majesty, the emperor, will accord a reception to them. The number of American visitors is expected to be very large, and every possible inducement will be held out for them. Fares on both American and German railroads will be materially reduced for that occasion, and the North German Lloyd and the Hamburg steamship lines have volunteered most extraordinary reductions. To be sure, comfortable quarters will be secured for you in advance. A great difficulty, however, has arisen in the question where the meetings of the Congress could conveniently be held, as there is in reality no hall in the German metropolis sufficiently capacious for the occasion. The special sections could easily be accommodated in the various departments of the university. It is most likely that the Renz Circus will be resorted to for the general meetings, though, it is to be sincerely hoped, that this selection will not prove a bad omen. It is a gratifying fact that the imperial government takes great interest in the Congress, and is willing to assign a large sum of money for the purpose. The medical faculty has concluded to publish a Berlin medical guide for the occasion, containing the history and accomplish

ments of the numerous medical institutions of Berlin. The guide will be translated into English for the benefit of the Anglo-American visitors by your correspondent. The Berlin Medical Society and the Verein für Innere Medicin will arrange a magnificent banquet and summer-night's festival in the Exhibition Park. An exhibition of chemicals and surgical instruments and appliances will be one of the features of the Congress. Koch and Virchow, besides, will show you the richest selection of histological, pathological, and bacteriological specimens ever produced.

Virchow is, no doubt, the most versatile man in the Fatherland. He is the busiest of Berlin's medical teachers, an indefatigable explorer with microscope and dissecting-knife, a steady contributor to medical literature, an active and eloquent member of the city councils, and last, but not least, one of the most energetic politicians of the empire. How the professor finds time to eat, sleep, and to receive, besides, almost daily American students inquiring about his courses is a perfect mystery. Being one of the Reichstag candidates the liberal party put up for Berlin, Virchow repeatedly spoke recently before crowded audiences. Only two days ago I heard the eloquent professor address what was probably the queerest audience a medical teacher had ever to deal with. The corona contained numerous Socialists evidently bent on mischief. But the catching eloquence of the speaker, his dissecting and demonstrative arguments, his sublime power and pathos, completely mastered and subdued the crowd. A Demosthenes could not have been more successful in rendering an obstreperous crowd tame and subservient. And yet, as yesterday's election proved, Virchow, the *lumen orbis terrarum*, the standard-bearer of light, liberty, and culture, could not overcome the Socialist Janiszewski, the book-binder, who can scarcely read or write German. Does it not in reality appear like a fight of light against darkness, of intelligence against ignorance? What a disgraceful testimony for the enlightened German metropolis!

The enlightenment of the German race, particularly of its academical classes, receives another doubtful illustration by the numerous victims the observation of the "code" constantly exacts. The medical students in particular do the most and bloodiest fighting. Those whose exalted calling it should be only to heal wounds are foremost in causing them. A few days ago two "mediciner" stood each other face to face on the "paukboden," as a fencing-room is termed in academical language. By an unintentional foul thrust of the rapier (foil), the left shoulder of one of the fencing-parties was pierced down to the bone. The bone itself was fractured, and the arm immediately fell down powerless. The limb, as was later on ascertained, was made useless for life. Possibly the telegraph has informed you of the affair that happened last week at the Freiburg University, where Eduard Salomon, a medical candidate, was killed in a three-pace distance pistol-duel. An American student at Berlin, too, tried his hand at it recently. In this case, however, there was a woman at the bottom of the duel,—viz., the boarding-house daughter where the young New York physician and his antagonist resided. The American shot the other party, a German medical student, in the left thigh. The university authorities and the government are solely to blame that this barbarous and mediæval appendage still flourishes in the German colleges. Of three students you meet Unter den Linden, two, at least, present their imaginary marks of honor on their slashed faces.

Death, the old reaper, is very busy just now among German medical celebrities. Professor Otto Becker, the famous Heidelberg ophthalmologist, has descended to the Plutonian shores soon after Volkmann, Troeltsch, and Westphal. Becker occupies in ophthalmological science an honored place alongside of Donders, Graefe, Arlt, and Helmholz. He was a pupil of Graefe and Arlt, and occupied the chair at Heidelberg for twenty-two years. His best known works are: "The Anomalies of Accommodation and Refraction," "The Visible Circulatory Movements in the Retina," "Pathology and Therapeutics of the Lens System," "Atlas of the Pathological Topography of the Eye," and "Congenital Total Color-Blindness." He had attained an age of sixty-two years.

Bergmann has again accomplished an exceptional feat of extensive plastic surgery. The case was that of a young lady, presenting a dark brown mole covering the entire right half of the face, the largest portion of the forehead, extended to the nose, chin, and eyelids, allowing but of a limited opening of the eye. The mole, aside from its huge extent, covered with hair, naturally produced a terrible disfigurement of the face, which was photographed before the operation. Bergmann operated in accordance with the plan laid out by Reverdin, of Geneva. The en-

tire mole was cut out, and the loss of substance made up by numerous small and thin flaps taken from the cutis of the patient's arm. The operation was an entire success, though the new facial integument still shows a net-work of curly lines. At all events, though the young lady will probably be unable to compete in the next beauty show, she has been transformed into a Venus when compared with her prior appearance.

I cannot conclude the letter without reporting the latest "rare case" of the Charité to you. Professor Leyden presented to the class a young lady affected with "schmerzfreude." It is a pity that I cannot translate that name for you, for "pain-joy" would convey no meaning to you. The patient, as the professor explained, belonged to that class of hysterical women who not only experienced no pain during an operation, but, on the contrary, had a morbid desire to have otherwise most painful operations performed on them WITHOUT AN ANÆSTHETIC. The patient in question had, during a paroxysm of hysteria, fractured her lower jaw and injured the facial artery. The injury proved a most serious one, and necessitated the ligation of the facial and carotid arteries, and, finally, the removal of part of the lower jaw. The patient insisted in having all three operations performed without an anæsthetic, and told the operator that she had derived great pleasure from the operation. *Nil admirari* says Horace.

BERLIN.

(From our Special Correspondent.)

The medical world in Berlin still remains under the ban of the influence of the influenza epidemic, which has now completed its journey from Russia over the whole of Europe, and extended across the ocean into America. The conferences held with regard to the disease at the great medical societies in Berlin concur in the opinion that the epidemic, which had appeared at first in such a benign form, had shown later in its course much severer symptoms. While at first it was regarded as an illness that would come to a favorable termination within three to four days, or within a week at the most, and that might merely set up disturbances in the digestive or respiratory organs, or in the general health for a time afterwards, later observations have shown that the affection has caused a great increase in the rate of mortality of those suffering from severe pre-existing general disease.

The same is to be said of the pneumonia, which appeared as a sequel and as a complication of the influenza, and which led to a speedy death in many cases. The view was pretty generally upheld that in these inflammations of the lung the usual pneumococcus would be found. Possibly there is another potent micro-organism present which is the direct cause of the concurrence of the influenza and the pneumonia. The mortality increased in a striking manner in the last weeks of December of the preceding year and in the first weeks of January of this year, not only in Berlin but in all the cities attacked by the epidemic, a fact to be attributed chiefly to the number of cases of disease of the respiratory organs, pneumonia in particular.

In order to gain a unity of opinion in regard to the course,—sequelæ, complications, method of treatment, and contagiousness of the influenza,—the committee on investigation appointed by the Society for Clinical Medicine had cards gotten up for distribution among all the German physicians, with notes of inquiry referring to these points. It was hoped that the replies would give a clear insight into many phases of the disease not yet fully understood. Notably has there been a difference of opinion as to whether the disease is of a miasmatic or contagious nature.

The cases of those who had made individual observations, favoring the one view or the other, exposed themselves in every instance to an attack from the opposite stand-point, that would render these valueless.

The result of the present investigation can surely be looked forward to with much eagerness.

The Berlin medical faculty have recently met with a serious loss. Professor Charles Westphal, the professor of nervous diseases and insanity, was released by death on January 27 from his long and painful nervous affection. Since he had already for a long time been prevented from doing active work of any kind in consequence of his disease, there was a dawning belief that hope might be entertained of seeing the noted lecturer and physician again in active duty at his old post. His disease, unfortunately, was increasing in its progress, and carried him away in his fifty-seventh year. His work will be carried on temporarily by his first two assistants.

Some time ago there happened to be a legal trial here, which also claimed the interest of the medical circle in a considerable measure, in so far that the medical specialists were wholly opposed in the case in question. A woman held that she had been thrown down stairs by a man. A fracture of the fifth cervical vertebra was reduced, in the case of the hysterical woman, by the physicians in attendance, the woman treated by extension bands, and cured. The counsel for the man made a telling defence before the court that the woman was led down the stairs, and so might have stumbled. While the first physicians held fast as to a fracture of the fifth cervical vertebra, the scientific deputation summoned to the medical aspect of the case, in unison with the specialists, gave an opposite opinion, declaring that the existence of a trauma could well be excluded, since the healing of a fracture in the column of the cervical vertebræ is very doubtful or rare ("who breaks his neck, must surely die"). But especially would a fracture in this case be doubtful, since the body of the fifth cervical vertebra cannot be felt by an examination through the mouth. The appearances presented by the woman could be derived from hysteria alone.

We have before us important alterations in the Berlin Hospital affairs. There will be opened in the course of this summer a special pavilion for diphtheritic children, as well as the polyklinic of the large, new children's hospital, which has been constructed at the instigation of the committee under the chairmanship of Professor Virchow, with the money raised by free donations. The laying out of the other wards—for measles, scarlet fever, and whooping-cough—will then follow, after a short time. This hospital, as well as the new City Hospital, which will also be completed within a few months, has been equipped according to the latest hygienic principles taught by medical science and experience. The medical department of the latter is under the direction of Professor Albert Fränkel, who has transferred it to the surgeon, Dr. Körte, a chemical assistant of the late Professor Wilms.

In the St. Hedwig's Hospital, which has been for years considered to be one of the best equipped hospitals in Berlin, the position of medical and surgical chief is now to be filled, an opportunity that also excites great interest among the medical fraternity. It is to be hoped that a subject will be revived, which has been most favorably discussed at head-quarters many times already, but the consideration of which has again come to a standstill. I refer to the plan of erecting hospitals for phthisical patients. Professor Leyden has just recently shown again the great importance of this subject. The enormous number of consumptives who exist in Berlin, and who formerly had to be treated in the general hospitals, would indicate that the time had arrived for constructing special hospitals for these patients. The reason offered is not so much that the disease should be isolated on account of its contagious character, since this would cause the hospitals to be regarded as "asylums for consumptives," but it is grounded on a medical and humane basis, since in general hospitals the provisions necessary for carrying out all the newest regulations of science for such diseases do not and cannot exist. Just as representatives of the medical profession have withdrawn from general practice in order to pursue special branches, so the future will show a division of the hospitals according to the special diseases. Our modern treatment of phthisis is founded on hygienic and dietetic principles. The latter includes the nourishment of the patient. The former was begun by the late Dr. Boehmer, of Görbersdorf. We know now that many of the theories, especially of a "zone free from phthisis," for a particular place, are untenable, and therefore the choice of an elevated position is of small importance; but, nevertheless, is there authority for demanding that each individual disease have its special hospital, even though it be granted that the treatment of phthisis in general hospitals can sometimes produce beautiful results. There cannot be much difficulty in finding a suitable place near Berlin to erect a hospital as described.

The deliberations and preparations for the Tenth Medical Congress, which takes place at Berlin in the beginning of August of this year, are progressing rapidly. The committee on organization are unceasing in their endeavors to make every provision for the proper reception of our many guests expected.

Berlin is fully equal to having the honor of welcoming within its walls the representatives of medical science from all parts of the globe, and the names of the members of the committee, as well as those of the chiefs and ushers in the separate departments, are security that the expectations which our foreign colleagues are given to entertain of the capital of the German empire will be fully real-

ized. Of especial importance to the American physicians will be the information that the committee has secured reduced rates of passage on the Hamburg-American Packet Company's line of steamers. We welcome this reduction in the expense attending the visit with much pleasure, as it must surely be a matter to be desired by our American colleagues.

DOSE OF FLUID EXTRACT OF GELSEMIUM.

To the Editor of the THERAPEUTIC GAZETTE:

DEAR SIR:—In regard to the dose of fluid extract of gelsemium sempervirens, of which there appears to be a considerable difference of opinion among some of the profession (see THERAPEUTIC GAZETTE, January, 1890), I would state that for the past twenty years I have been using this remedy largely, and find that 5 minims, repeated every three or four hours, will, in the majority of my cases, produce its characteristic effect,—confused or double vision,—after four or five doses have been taken, and that many patients cannot take more than 4 minims at intervals of three hours.

JOHN S. HUGHSON, M.D.

SUMTER, S. C.

Notes and Queries.

A NEW CONSTITUENT OF TEA.

In the *Zeitschrift für Physiologische Chemie* ROSSEL writes of a new base—theophylline—found by him in an alcoholic extract of tea sent him by Dr. F. Witte, of Rostock. The nated by crystallization. After various manipulations to remove other bodies, an ammogreater part of the caffeine had been eliminiacal solution of silver precipitated a double salt of theophylline and xanthine. The xanthine was removed by several hours' evaporation, which process, being continued, gave rise to brown needles of theophylline containing one molecule of water of crystallization and having the formula $C_7H_8N_4O_2$.

Theophylline is isomeric, but not identical, with theobromine and paraxanthine. Its crystals are colorless, thin, narrow, about five millimetres long, bounded by two flat surfaces, and by two that are variably rounded. The diagonal section is hexagonal. It melts at 264° C., crystallizes readily from a watery solution, and dissolves easily in warm water and in weak ammonia-water, but not so readily in cold as in hot alcohol. The crystallized chloride is obtained by evaporating with hydrochloric acid. The salts seem to be decomposed by water into their constituent parts of acid and base. If platinic chloride is added to a concentrated solution of theophylline chloride, quadrilateral crystals are formed. The double gold salt, as well as the double platinum salt, crystallizes in acicular forms, grouped in tufts in the former. This grouping is found in the very important compound formed with sodium. If theophylline is evaporated with nitric acid, a yellow body results, which becomes still yellower if ammonia is added, and not red, as is the case with xanthine. In the "Weidel reaction" with a solution of chlorine, with evaporation to dryness, a scarlet substance remains, which turns violet when treated with ammonia, and becomes colorless when treated with an excess of sodic hydrate.

These same reactions take place with theobromine. The analogy between theobromine and theophylline led Rossel to suppose that, as the former was a dimethylxanthine, and caffeine a trimethylxanthine, theophylline might have a similar constitution. The question was decided by treating the silver salt of theophylline with methyl iodide, with the addition of methyl alcohol, in a closed tube for twenty-four hours at 100° C. On cooling the tube, a coherent mass of silver iodide was found, bearing a voluminous crystallized substance. These crystals dissolved in hot methyl alcohol, and separated again on cooling. Analysis showed that the addition of a methyl group had taken place. The resulting body was identical in reactions with caffeine.

The position of the methyl group now remained to be determined. E. Fischer had proved that under the conjoint influence of potassic chlorate and hydrochloric acid, theobromine was decomposed into monomethylalloxan and monomethylurea, thus giving a methyl group to each resulting body. His method being employed, a substance was formed that was identical with amalic acid, an oxidation product of caffeine discovered by Rochleder. This is formed from caffeine by the same method as from theophylline, and is a reduction product of dimethylalloxan, being itself tetramethylalloxantin. Both methyl groups are thus contained in the alloxan radicle. Strecker, in his synthetic experiments on theobromine, discovered a substance isomeric with it, and Rossel supposes it to be identical with the one he has now described.—*New York Medical Journal*, February 8, 1890.

A RARE CASE OF IDIOSYNCRASY TO THE EXTERNAL USE OF TANNIN.

While the list of substances which in different individuals, whether internally or externally administered, are incapable of being tolerated is a very large one, tannin has as yet not been included in the list in which its external employment from idiosyncrasy is rendered impossible. In the *Deutsche Medicinische Wochenschrift*, January 24, 1890, however, DR. VICTOR LANGE reports the case of a man, 29 years of age, who consulted him on the 25th of April last for chronic nasal and pharyngeal catarrh. The history of the case was one of difficult respiration through the nose from early childhood, although the condition had recently become greatly aggravated, and there was a profuse secretion from the nose. Galvano-caustic treatment of the nose had a number of times been attempted, with transient improvement of condition. On examining the nose and the pharynx, the mucous membrane was found to be swollen and reddened, while the mucous membrane of the trachea was somewhat injected, although the vocal cords were normal. The pharynx was then painted with a solution of tannic acid, 1 part to 15. Immediately after the application there was great swelling of the mucous membrane, producing complete occlusion of the nose and a profuse watery secretion. On examination, there was great œdema of the soft palate and uvula, which hung down on the tongue, which condition was somewhat relieved by cold applications around the neck and ice given in small pieces internally. An hour later the patient returned, and complained of intolerable itching all over the entire body. It was found to be the seat of a general eruption of urticaria. On the next day this had disappeared, and the mucous membrane of the pharynx was now only a little swollen; but the uvula remained œdematous for a day or two. The patient reported that twice previously somewhat similar symptoms had followed the use of tannin,—once in the form of powder and another time in the form of a solution applied externally. Though it might be expected that in extremely susceptible cases a strong solution of tannin on a sensitive mucous membrane might produce sufficiently marked irritation to lead to the production of œdema, yet in this case the solution was by no means a strong one, and the action of the tannin was not confined to a local irritation, but produced general poisoning.

LACTATION DURING MENSTRUATION.

Ever since the days of Hippocrates and Galen, the belief has obtained that perfect lactation was inconsistent with the return of the menses. In a paper recently read before the Royal Medical Society of Vienna, by DR. SCHLICHTER, the result of this belief is seriously called in question, and there seems good reason to conclude that the effect of menstruation on the milk is not necessarily detrimental. The author obtained a number of samples of milk furnished by menstruating nurses and analyzed them with the result of showing that, as a matter of fact, the relative proportion of casein had undergone no diminution. The quantity of fat was variable, but the variations did not exceed those met with in non-menstruating lactifers, and the maximum occurred just as often during a menstrual period as after or before. On only one occasion did the proportion of the non-fatty constituents diminish to the extent of 1.5 per cent., and the proportion remained practically the same. He remarked that in the cow the advent of the rut does not produce any noteworthy variation in the quality of the milk. Taking the results of the analyses as a whole, it was found that the variations in the quality of the milk before, during, and after, menstruation were not as marked as in milk drawn at different hours of the day under ordinary circumstances. An examination of the infants, moreover, failed to demonstrate any constitutional disturbance or failure of nutrition provided the menses did not return earlier than the sixth week. Although we are not prepared to endorse the very categoric conclusions of the author, it may be admitted that the occurrence of menstruation in nursing women is less hurtful than has generally been believed, but it is none the less a matter of clinical observation that their recurrence does diminish the quantity of the secretion, and may even cause it to cease at an earlier date. The supervention of pregnancy is under any circumstances a barrier to continued lactation, as much in the interest of the mother as in that of the child.—*Medical Press*, January 22, 1890.

ANTIPYRIN AND CHLORAL HYDRATE.

A few months since (*Pharm. Journ.*, July 27, p. 61) M. Blainville reported that when antipyrin and chloral hydrate are dispensed together an oily liquid is formed, in which crystals are subsequently found possessing

the taste of neither the one nor the other compound. This statement is confirmed by HERR LUDWIG REUTER, who has made a closer investigation of the crystals as to their nature (*Apot. Zeit.*, January 25, p. 45). They were found to be only slightly soluble in cold alcohol, ether, or chloroform, a little more soluble in boiling alcohol and boiling water, and totally odorless and tasteless. When treated with cold caustic soda solution there was no separation of chloroform, while with ferric chloride there was only a slight yellow coloration, not at all the characteristic red of antipyrin. Upon heating the crystals with caustic soda solution, decomposition took place, traces of chloroform being at first given off, and then much isonitril, together with a separation of antipyrin and its decomposition products; the acidulated liquid then gave an intense red color with ferric chloride. Nitrous acid had no effect upon the crystals in the cold, the characteristic blue-green of isonitrosoantipyrin not being produced. It would appear, therefore, that from antipyrin and chloral hydrate a rather stable compound is formed, described by Herr Reuter as "trichloraldehydphenyldimethylpyrazol," with which composition he considers the results of his analyses to have been in accord. He states that the same compound is formed, also, easily obtained upon heating together chloral hydrate and antipyrin to 115° C., and that it crystallizes from alcohol in dense scales. Upon rabbits the new compound failed to produce the effects characteristic of either of its constituents, and, as far as the experiments went, it appeared to be a therapeutically indifferent body.—*Pharmaceutical Journal and Transactions*, February 1, 1890.

SULPHUR WORTHLESS FOR FUMIGATION.

It appears that the prevailing method of disinfection by means of burning sulphur is considered by some of the leading bacteriologists as of less value than it has heretofore been considered, though we print in another column an abstract of a paper by Dr. Edson, who strenuously maintains the contrary. DR. J. G. JOHNSON, on the other hand, read a paper before the Kings County Medical Society on the 17th ult., in which he stated that he had proved the present system of fumigation as worthless for the destruction of disease-germs; that the fumes of burning sulphur do not penetrate woollens as disease-germs do. He also stated that he had propagated diphtheria from the clippings of blankets after they had undergone a thorough process of fumigation by burning sulphur. Dr. Prudden, of the New York City Board of Health, appears to have come to the same conclusion, and in both New York and Brooklyn currents of steam are to be recommended for disinfecting purposes instead of burning sulphur.—*Medical Record*, January 4, 1890.

ARISTOL.

In a communication recently published by Messrs. Messinger and Vortmann, upon a new series of compounds of iodine with phenol like bodies, special reference was made to a thymol compound as a possible rival to iodoform, under the name "annidalin" (*Pharm. Journ.*, September 26, 1889, p. 241). It is probably a somewhat more definite form of this compound that has recently been reported upon by DR. EICHHOFF under the name "aristol" (*Apot. Zeit.*, January 25, p. 46). This compound is said to be formed, as a voluminous red brown amorphous precipitate, when an aqueous solution of iodine in potassium iodide is treated with thymol in caustic soda solution. It is represented as being dithymoldiodide, in which the hydrogen of the two hydroxyls of dithymol is replaced by two equivalents of iodine; the compound is, therefore, calculated to contain 45.8 per cent. of readily removable iodine. Aristol is described as being insoluble in alcohol and freely in ether, but precipitated from the ethereal solution on the addition of alcohol. It is also soluble in fixed oils, but it is necessary to effect solution without heat to avoid decomposition, and for the same reason it must be kept sheltered from light. Upon distilling the compound with lime, dithymol is obtained. Aristol is said to be non-poisonous, it not being absorbed by the organism. It is claimed that it shares with chrysarobin the property of being an active but harmless remedy in psoriasis, with the advantage that it does not cause the same intense coloration of the skin or produce symptoms of conjunctivitis. Further, it is said to act as favorably and quickly as the best remedies in mycosis and lupus, without being so irritating as some, and to be valuable as a dusting-powder for wounds and burns.—*Pharmaceutical Journal and Transactions*, February 1, 1890.